No. 77-1658

Supreme Court, U. S.
FILED
MAY 22 1978
MICHAEL RODAK, JR., CLERK

In the Supreme Court of the United States

OCTOBER TERM, 1977

JAMES R. CRICCHI,

Petitioner,

vs.

CHARLES T. NABER and GEORGE C. LOCKWOOD,

Respondents.

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

CLEMENS HUFMANN
REGINALD K. BAILEY
20 North Wacker Drive
Chicago, Illinois 60606
Attorneys for Petitioner

Of Counsel:
MASON, KOLEHMAINEN,
RATHBURN & WYSS
20 North Wacker Drive
Chicago, Illinois 60606

JAMES B. HINSON
Westinghouse Electric Corporation
Patent Department
Churchill Borough
Pittsburgh, Pa. 15235

SORG/CHICAGO U.S.A.

TABLE OF CONTENTS

	PAGE
Opinions Below	1
Jurisdiction	2
Statutes Involved	2
Questions Presented	3
Statement	4
Reasons for Granting the Writ	9
I. Summary	9
Question 1	9
Question 2	9
II. An Inventor Who Works in Good Faith to Embody his Invention in a Useful Physical Device Rather than a Laboratory Curiosity Meets the Statutory Requirement of Reasonable Diligence	10
a) The Evidence Pertinent to the First Time Segment, June to October 1970	10
b) The CCPA's Holding has no Support in the Statute, Conflicts with Precedents of the Courts of Appeals and Confuses the Reasonable Diligence Standard	12
III. The CCPA Decision Departs from the Customary Standard of Judicial Review	17
a) The CCPA Decision Rejects the Accepted and Usual Standard of Judicial Review Expressly Subscribed to in CCPA Precedents	17
b) The Evidence Pertinent to the Second Time Segment, October 1970 to September 1971	19
Conclusion	23

TABLE OF AUTHORITIES

Cases

PAGE

Abbott v. Shepherd, 135 F.2d 769 (D.C. App. 1942) 15

Bell Telephone Labs. v. Hughes Aircraft Co., 564 F.2d 654 (3rd Cir. 1977), *affirming*, 422 F.Supp. 372 (D. Del. 1976), *cert. denied*, 197 USPQ 448 (March 20, 1978) 8, 13

Clancy v. De Jahn, 36 F.2d 131 (CCPA 1929) 12

Daley v. Wiltshire, 293 F.2d 677 (CCPA 1961) 18

Goodrich v. Harmsen, 442 F.2d 377, 58 CCPA 1144 (CCPA 1971) 16

Hamer v. White, 143 F.2d 987 (CCPA 1944) 18, 23

Kitchen v. Smith, 39 App. D.C. 500 (1913) 14

Marconi Wireless Co. v. United States, 320 U.S. 1, 63 S.Ct. 1393 (1943) 16

Reinhart v. Coursen, 458 F.2d 516 (CCPA 1972) 12

Rodli v. Phillippi, 154 F.2d 139 (CCPA 1946) 18

Sargent v. Vetter, 48 App. D.C. 582 (1919) 14

Smith v. Hayward, 176 F.2d 914 (CCPA 1949) 18

Voisinet v. Coglianese, 455 F.2d 1064 (CCPA 1972) .. 18

Watkins v. Wakefield, 443 F.2d 1207 (CCPA 1971) 12

Woods v. Poor, 29 App. D.C. 397 (1908) 14

PAGE

STATUTES

28 USC §1256 2

35 USC §102(g) 2, 3, 7, 12, 13, 16

35 USC §135(a) 6

35 USC §135(b) 16

35 USC §141 .....2, 3, 9, 10, 15, 17

35 USC §144 .....3, 17

ARTICLES AND COMMENTARIES

Williamson, "Siemens Starts Second but Finishes First," Fortune, April 10, 1978, p. 58 4

Federico, "Commentary on the New Patent Act," 35 U.S.C.A. 1 (1954) 13

In the
Supreme Court of the United States

OCTOBER TERM, 1977

NO.

JAMES R. CRICCHI,

Petitioner,

vs.

CHARLES T. NABER and GEORGE C. LOCKWOOD,

Respondents.

PETITION FOR A WRIT OF CERTIORARI TO THE UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

James R. Cricchi respectfully petitions for a writ of certiorari to review the judgment of the United States Court of Customs and Patent Appeals* in the above-entitled case.

OPINIONS BELOW

The opinion of the CCPA (App. 1a-10a)** is reported at 567 F.2d 382, 196 USPQ 294 (1977.) The opinions of the

---

* Hereinafter usually referred to as "CCPA".

** "App." as used in this petition refers to the Appendix presented with this petition.

Board of Patent Interferences* (App. 10a-26a) are unreported.

JURISDICTION

The CCPA judgment was entered on December 22, 1977. The CCPA denied Cricchi's petition for reconsideration on February 23, 1978. The jurisdiction of this Court is invoked under 28 USC 1256.

STATUTES INVOLVED

35 USC § 102

Conditions for patentability; novelty and loss of right to patent

A person shall be entitled to a patent unless—

• • •

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

35 USC § 141

Appeal to Court of Customs and Patent Appeals

An applicant dissatisfied with the decision of the Board of Appeals may appeal to the United States Court of Customs and Patent Appeals, thereby waiving his right to proceed under section 145 of this title. A party to an interference dissatisfied with the decision of the board of patent interferences on the question of priority may appeal to the United States Court of Customs and Patent Appeals, but such appeal shall be dismissed if any adverse party to such interference,

* Hereinafter usually referred to as the "Board".

within twenty days after the appellant has filed notice of appeal according to section 142 of this title, files notice with the Commissioner that he elects to have all further proceedings conducted as provided in section 146 of this title. Thereupon the appellant shall have thirty days thereafter within which to file a civil action under section 146, in default of which the decision appealed from shall govern the further proceedings in the case.

35 USC § 144

Decision on appeal

The United States Court of Customs and Patent Appeals, on petition, shall hear and determine such appeal on the evidence produced before the Patent and Trademark Office, and the decision shall be confined to the points set forth in the reasons of appeal. Upon its determination the court shall return to the Commissioner a certificate of its proceedings and decision, which shall be entered of record in the Patent and Trademark Office and govern the further proceedings in the case.

QUESTIONS PRESENTED

1. Is the "reasonable diligence" requirement of 35 USC 102(g) met for a time period during which the first inventor and his associates work on improving a fabricating technique which they in good faith regarded as required for the manufacture of a satisfactory device embodying the invention?

2. Under 35 USC 141 a "party . . . dissatisfied with the decision of the Board of Patent Interferences may appeal to the United States Court of Customs and Patent Appeals . . . ." Under 35 USC 144 the CCPA "shall hear and determine such appeal on the evidence produced before the Patent and Trademark Office . . . ." Under these provisions is the standard of review determined in each individual case by the CCPA's discretion or is the CCPA bound

to follow the customary standards of judicial review to which it had subscribed in its own precedents?

STATEMENT

The proceedings from which this petition arises were conducted to determine which of the parties is entitled to a patent for a new and improved transistor.

The development of transistors and associated solid-state technology has resulted in the application of electronics to more and more aspects of our everyday life. In the field of radio and television transistors, due to their small weight, size and power consumption, and their reliability and durability, have almost completely displaced vacuum tubes. With the evolution of the integrated circuit, in which hundreds of transistors may be simultaneously fabricated in a tiny wafer of silicon, the use and application of transistors is increasing even more rapidly.

Led by American business and research institutions, large and small enterprises in the major industrial countries are straining to advance the frontiers of the art of microelectronics and integrated circuits. The Ministry of Technology of the Federal Republic of Germany reportedly "considers microelectronics the most important frontier of all . . ." Williamson, "Siemens Starts Second but Finishes First," Fortune, Apr. 10, 1978, pp. 58, 68.

One field in which transistors were not used extensively is the storage of digital data for use with computers. This function was conventionally performed by magnetic core memories which are disadvantageous because they are relatively bulky, difficult to fabricate and consume substantial power (TR 1149).*

---

* "TR" as used in this petition refers to the printed Transcript of Record in the CCPA.

The invention relates to a type of transistor made of layers of metal, silcon nitride and silicon dioxide on a semiconductor base or substrate, usually referred to as an MNOS device. This type of transistor has the capacity to store positive or negative electrical charges in response to a voltage pulse representing a data bit. The charges tunnel through the thin oxide layer of the device and are trapped at the nitride-oxide layer interface. The trapped charges constitute the "memory" of the device and the injection of the charges is referred to as "writing" into the memory. The stored charge is retained even when electrical power is not supplied to the device. The MNOS device thus has a "nonvolatile" memory.

To store digital data large numbers of these memory transistors can be used in a so-called memory "matrix" or memory "array." These memory arrays are particularly useful in computers which typically require the storage of large amounts of data. A data bit stored in the memory transistor can be repeatedly read from the memory without erasing the stored bit, this characteristic being referred to as "nondestructive readout."

Transistors which preceded the MNOS memory transistor found only limited use as memory elements for computers because they lacked nonvolatile memories and because two transistors were required to store a single bit of data. MNOS memory transistors overcome these disadvantages and are likely to supersede the magnetic core memories now in widespread use because MNOS memory transistor arrays require less power to operate and are smaller and easier to fabricate than magnetic core memories (TR 1149).

The present invention is directed to the solution of problems which "must be overcome before state-of-the-art MNOS devices can become practical" (TR 201). Cricchi

conceived of his invention in connection with a proposal dated October 22, 1969, which Westinghouse made to the Air Force Avionics Laboratory (TR 891-994). Westinghouse proposed a 1-year exploratory development "to achieve the necessary technology base for designing and fabricating discrete devices and arrays of silicon nitride variable threshold* transistors suitable for digital storage" (TR 949). The proposal was for memory arrays having fast read/write characteristics (approximately 1,000 times faster than prior Westinghouse MNOS devices) and designed so that the threshold would not change appreciably under continual read/write cycling (TR 949). To accomplish these objectives devices having a very thin oxide film were required (TR 950).

Naber and his co-inventors** thought of the invention in June of 1970, i.e., about seven months later than Cricchi. Naber filed a patent application on December 3, 1970 and received the patent on March 6, 1973 (TR 195).

Cricchi's patent application was filed on January 20, 1972 as Serial No. 219,463 (TR 11). On April 18, 1973 the Patent Examiner required Cricchi to amend his application by adding thereto claim 10 and other claims of the Naber patent which find support in Cricchi's patent application (TR 49, 50). An interference was officially declared on May 31, 1974 (TR 876) to determine the "question of priority of invention . . ." (35 USC 135(a)). In support of their respective claims to priority, both parties introduced documentary evidence and the testimony of the inventors and their collaborators.

---

* The term "variable threshold" refers to the above-described storage of positive or negative charges at the oxide-nitride interface when writing into memory.

** Hereinafter collectively referred to as "Naber".

The date of satisfactory physical completion of Cricchi's invention was a matter of dispute. The earliest tests which the Board found to be independently corroborated were conducted on September 28, 1971. That date was consequently regarded as Cricchi's date of actual reduction to practice (App. 18a).

The principal question on which the award of priority depended in the opinions of the lower tribunals is whether Cricchi and his collaborators had "reasonable diligence" from June 1970 to September 28, 1971 as required by 35 USC 102(g). Cricchi had the burden of proving his priority by a preponderance of the evidence (App. 13a).

Cricchi relied on evidence tending to show that from June 1970 to October 1970 Westinghouse worked to improve the technique of depositing the various layers of silicon dioxide and silicon nitride comprising the MNOS device, and that such work was considered necessary for a commercially satisfactory reduction to practice.

Cricchi's evidence relating to activities during the October 1970 to September 1971 period includes his own testimony, the testimony of seven of his co-workers, a large number of contemporaneous documents and several physical exhibits of which CX III-1* and CX III-2 are particularly important.

The Board held that Cricchi had been diligent during both segments of the diligence period, i.e., from June 1970 to October 1970 and from October 1970 to September 28, 1971. The Board also noted in its opinion of June 28, 1976 (App. 22a) that Naber's brief at final hearing before the Board did not question that Cricchi's activities between October 1970 and September 1971 met the statutory re-

---

* "CX" as used in this petition refers to Cricchi exhibits in evidence.

quirement of "reasonable diligence". That issue was raised more than one month after the Board's decision in Naber's request for reconsideration (TR 1104-1109). The Board denied this request (App. 24a-26a).

Upon appeal to the CCPA the Board was reversed and priority of invention was awarded to Naber. The CCPA held that Cricchi did not have reasonable diligence during either segment of the critical time period. Cricchi petitioned for rehearing on the grounds that:

(1) the CCPA's holding concerning the June to October 1970 period was legally erroneous and in conflict with *Bell Telephone Labs.* v. *Hughes Aircraft Co.*, 422 F.Supp. 372 (D. Del. 1976) (App. 31a-51a)* and

(2) there was massive and well-corroborated evidence of diligence covering the period from October 1970 to September 1971.

On February 23, 1978 the CCPA denied Cricchi's petition for rehearing without opinion.

* Affirmed, 564 F.2d 654 (3rd Cir. 1977), (App. 27a-31a), cert. denied, 197 USPQ 448 (March 20, 1978).

REASONS FOR GRANTING THE WRIT

I. SUMMARY

Question 1. The Constitution in Article 1, Section 8, and the Patent Statute intend to stimulate the progress of the useful arts by rewarding the first inventor. The decision below in effect withholds the reward from the inventor who first had the clear and concrete idea of the invention and who endeavored in good faith to embody his inventive idea in a useful structure.

According to the decision below the first inventor's right to patent protection is forfeited to a later inventor, unless the first inventor immediately embodies his invention in a laboratory device which he does not regard as useful or satisfactory for the intended purpose. The CCPA's holding in this respect conflicts sharply with the law of other federal courts of appeals.

Question 2. The Board ruled that Cricchi's evidence constituted a corroborated showing of reasonable diligence during the period from October 1970 to September 1971. The CCPA's reversal of this ruling is not based on any error of law in the Board's decision and ignores extensive and well-corroborated evidence of diligence. If 35 USC 141 confines the CCPA to the accepted and usual standards of judicial review, the Board's holding could not have been reversed without a thorough review of the record and a reasoned conclusion that the ultimate fact found by the Board was against the manifest weight of the evidence.

The proper administration of justice is jeopardized if a tribunal whose own precedents establish its role as narrowly appellate is at liberty to depart from that role and

act as an unreviewable finder of ultimate fact. The standard of review inherent in 35 USC 141 has not been defined by this Court or by statute. Unpredictable vacillations concerning the standard of CCPA review are likely to continue, unless this Court defines that standard.

II. An Inventor Who Works in Good Faith to Embody His Invention in a Useful Physical Device Rather than a Laboratory Curiosity Meets the Statutory Requirement of Reasonable Diligence.

a) The Evidence Pertinent to the First Time Segment, June to October 1970.

Westinghouse had started its work on improving layer deposition techniques for MNOS devices before October 1969 and continued such work long after the present invention had been reduced to practice. As stated by NCR's Dr. Kendall, work of this nature was required to obtain "reliably and consistently" . . . "good nitride layers, good oxide layers" and to get "nitride layers of the right electrical conductivity" (TR 819). At Westinghouse these problems with the layer deposition technique had not been solved when Cricchi conceived the invention and admittedly remained unsolved "right up to the end of 1969." To build MNOS devices that would last for more than "a few hours" Naber's assignee, NCR, had spent "a year in preliminary research" of the same kind before June of 1970 (TR 818-820).

Dr. Corak, the Manager of Solid State Technology of the Westinghouse Systems Development Division, as well as Cricchi testified that a device embodying the "basic idea" conceived by Cricchi could have been built within three to six months (TR 306, 342). However, the layer deposition work at Westinghouse was considered necessary

"in order to make a feasible device--feasible in terms of having a device other than a laboratory curiosity" (TR 358). Cricchi considered the work on layer deposition techniques necessary because "we operate in an environment where the fundamental characteristics were of primary importance" (TR 306). The inventor and his collaborators (TR 275):

> "were not satisfied with . . . [their] fundamental understanding of the nitride-oxide structures required, both the nitride thick oxide, and the nitride thin oxide structure required to build the 1969 structure [i.e., the invention]."

The Board agreed with Dr. Corak and Cricchi that the work done at Westinghouse during the June to October 1970 period was "required in order to reduce to practice the transistor conceived by Cricchi on October 22, 1969" and constituted "reasonable diligence" (App. 23a). The Board denied Naber's petition for reconsideration of the quoted holding, saying:

> ". . . even though the device at issue possibly could have been built without the additional work on layer formation, the technology had not been developed at Westinghouse to the point where such devices could have been constructed with the expectation that they would exhibit *the necessary properties and characteristics required* of memory devices" (App. 25a). (Emphasis added).

The CCPA reversed and held with respect to this issue that work "directed at improving oxide and nitride layer deposition techniques generally applicable to all MNOS devices did not satisfy the requirement of 'reasonable diligence' on the part of Cricchi" (App. 7a).

The CCPA noted that work on improving layer deposition technique had commenced at Westinghouse before the date of Cricchi's inventive concept and had continued after

the invention was reduced to practice. The CCPA said that treating this layer deposition work as "reasonable diligence" for the June to October 1970 period would "grant Cricchi a reservoir of 'reasonable diligence'" and would defeat the public "policy [which] favors the early disclosure of inventions" (App. 7a). The CCPA emphasized that the layer deposition work during June to October of 1970 would not qualify as "reasonable diligence" because it was "needed to produce a commercially acceptable device. . . ." (App. 7a).

The CCPA opinion does not expressly place upon the first inventor "an absolute obligation to choose the simplest device embodying the structure of the counts to attempt a reduction to practice" (App. 6a, note 3). However, the opinion gives the first inventor no reasonable leeway in this regard. It holds legally insufficient the inventor's efforts directed toward the development of a technique which he considers a "necessary, preliminary" (TR 226) "essential, fundamental step" (TR 227) to the construction of a useful device rather than a mere laboratory device (App. 5a-7a). The CCPA apparently believed that its present holding was little more than an application of its own precedents. Petitioner submits that the present holding goes far beyond the precedents cited by the CCPA and conflicts with at least some CCPA decisions, *Clancy* v. *De Jahn*, 36 F.2d 131 (CCPA 1929), *Watkins* v. *Wakefield*, 443 F.2d 1207, 1209, 1210 (CCPA 1971) and *Reinhart* v. *Coursen*, 458 F.2d 516 (CCPA 1972).

b) The CCPA's holding has no Support in the Statute, Conflicts with Precedents of the Courts of Appeals and Confuses the Reasonable Diligence Standard.

35 USC 102(g) speaks of "reasonable diligence" without mentioning the object of such diligence. However, it

is well accepted that the object must be the same as that referred to in predecessor statutes, namely, "diligence in adapting and perfecting the [invention] . . ." Federico, "Commentary on the New Patent Act," 35 USCA pp. 55, 56. The statute lacks any indication that efforts to perfect the invention should not be counted as reasonable diligence or that the inventor has no reasonable discretion in selecting the path to be followed in adapting and perfecting the invention.

The most recent example of the correct application of 35 USC 102(g) to a similar situation is *Bell Telephone Labs.* v. *Hughes Aircraft Co.* (App. 27a-31a), *affirming*, (App. 31a-51a), cert. denied, 197 USPQ 448 (March 20, 1978). The *Bell* case turned on the question of reasonable diligence in reducing to practice an invention relating to a "silicon gate field effect transistor" (App. 27a) which must be fabricated in essentially the same manner as Cricchi's MNOS device. The Third Circuit held (App. 29a):

> "It is doubtless true that work quite unconnected with the reduction of an invention to practice cannot be considered. But whether particular work is sufficiently connected with the invention to be considered to be in the area of reducing it to practice must be determined in the light of the particular circumstances of the case which may be as varied as the mind of man can conceive. It is thus peculiarly a question of fact . . . ." (Footnote omitted)

In the *Bell* case the district court had found diligence and priority of invention in favor of an inventor who had spent much time on experimentation "directed to solving . . . a problem which in itself would not have precluded a successful reduction to practice" (App. 46a). According to the *Bell* case (App. 50a, note 19):

> ". . . work on problems inhibiting *commercial utilization* of the process should be deemed reasonable diligence, whether that work encompasses the whole of the process, one step in the process, or an ultimately abandoned step." (Emphasis added)

The CCPA in the present case ruled that work directed to a "commercially-acceptable device" does not constitute diligence (App. 7a).

These views are in irreconcilable conflict. Grave injustice to the parties is likely to result from the conflict between the CCPA and the Third Circuit. The claims which the CCPA decision awarded to Naber will be held invalid in the Third Circuit upon the same evidence of Cricchi's prior invention which was before the Board and the CCPA. Thus, the principal benefit of the CCPA decision does not accrue to either the first or the second inventor but to an infringer who selects the Third Circuit to litigate the validity of the Naber patent.

The Court of Appeals for the District of Columbia subscribes to a rule diametrically opposed to that adopted in the present case, *Woods* v. *Poor*, 29 App. D.C. 397 (1908), *Kitchen* v. *Smith*, 39 App. D.C. 500, 502 (1913) and *Sargent* v. *Vetter*, 48 App. D.C. 582 (1919). The *Kitchen* case holds:

> "that an inventor is rather to be commended than blamed for attempting to make his invention as complete and practical as possible before applying for a patent instead of entering the office with it in a crude and incomplete state—see *Griffin* v. *Swenson*, 15 App. D. C. 135-142; and cases there cited . . . ."

According to the *Sargent* case, an inventor who spends eight months endeavoring to start commercial manufacture of the invention does not lack diligence even though it "would have cost but a few dollars to have had a device embodying the invention made . . . ." The District of

Columbia has consistently adhered to its version of the reasonable diligence rule as illustrated in an opinion by Justice Rutledge shortly before his elevation to this Court, *Abbott* v. *Shepherd*, 135 F.2d 769, 770 (D.C. App. 1942):

> "In view of his priority in conception, Abbott is entitled to priority in invention if he reduced it to practice prior to March 19, 1934, or if he maintained due diligence *in perfecting it until the time of his application.*[2]
>
> [2] Cf. Woods v. Poor (1), 1907, 29 App. D.C. 397; Kitchen v. Smith, 1913, 39 App.D.C. 500; Saurer v. Groebli, 1916, 45 App.D.C. 298; Dickinson v. Swinehart, 1920, 49 App.D.C. 222, 263 F. 474; Gammeter v. Backdahl, 1920, 50 App.D.C. 45, 267 F. 347; Joy v. Morgan, 1924, 54 App.D.C. 110, 295 F. 931." (Emphasis added)

The conflict between the rule announced by the CCPA in the present case and the consistent judicature of the Court of Appeals for the District of Columbia and the Third Circuit create a severe conflict. Resolution of this conflict is particularly imperative because review of priority awards made by the Board of Patent Interferences is bifurcated under 35 USC 141. An inventor who loses an interference because the Board adopted the CCPA's narrow rule of reasonable diligence will maneuver for review in the Third Circuit or the District of Columbia. Conversely, the Board's application of the more liberal rule followed in the Third Circuit and the District of Columbia will cause the loser to seek review in the CCPA. The frequency of appeals is likely to increase since the Board cannot preselect its ratio decidendi to conform to the rule accepted in the eventual court of review.

The existence and importance of the conflict cannot be obscured by subsidiary reasons given by the CCPA for its rule that efforts toward creating commercial utility cannot be reasonable diligence.

The CCPA decision (App. 6a) cites *Goodrich* v. *Harmsen*, 442 F.2d 377, 383, 58 CCPA 1144 (CCPA 1971). That case merely exemplifies the well-established rule that an actual reduction to practice can occur before the invention is ready for commercial production. The rule of the *Goodrich* case need not be repudiated to accept the standard of reasonable diligence adopted in the Third Circuit and the District of Columbia. The rule of the *Goodrich* case bears no logical or policy relation to a rule which equates efforts to bring the invention closer to commercial acceptability with lack of reasonable diligence.

Nor can the CCPA's restrictive standard of reasonable diligence be supported by reference to the policy favoring "the early disclosure of inventions" (App. 6a, note 5, 7a). That policy is not the only lodestar of the patent law. Rather the scope and function of the early disclosure policy is statutorily circumscribed by the one-year preclusion period of 35 USC 135(b)* and the clause of 35 USC 102(g) which denies patents to inventors who "had abandoned, suppressed or concealed" their inventions. The sentence of 35 USC 102(g) which embodies the reasonable diligence requirement puts no time limit on reasonable diligence. Indeed, the reasonable diligence standard expresses a policy favoring the first inventor. As stated in *Marconi Wireless Co.* v. *United States*, 320 U.S. 1, 34, 63 S.Ct. 1393, 1409 (1943):

> "It is well established that as between two inventors priority of invention will be awarded to the one who by satisfying proof can show that he first conceived of the invention."

---

* "A claim which is the same as, or for the same or substantially the same subject matter as, a claim of an issued patent may not be made in any application unless such a claim is made prior to one year from the date on which the patent was granted."

The policy in favor of the party who first conceived of the invention is just as worthy as the policy in favor of early public disclosure.

The CCPA's remark about "a reservoir of 'reasonable diligence'" (App. 7a) apparently implies that no segment of an ongoing developmental program can ever qualify as reasonable diligence in reducing to practice an invention conceived after the start of such program. This view is not compelled by logic and is surely at odds with experience. Advanced technology and useful inventions are nurtured and arise from the confluence of separate arts and developmental programs. Since inventions tend to spring from commercial and practical motives an inventor should be permitted to engage in the preliminary and intermediate work regarded in good faith as necessary for a reduction to practice which can be expected to satisfy the inventor and achieve the goals which he has set. The natural inclination of a researcher or engineer is to develop his invention to the point of practical usefulness rather than into a laboratory curiosity. Budgets for research and development are finite. They should not be burdened with expenses to build mere laboratory devices solely to comply with a legal requirement which must seem arbitrary and unnecessary to the researcher.

III. The CCPA Decision Departs from the Customary Standard of Judicial Review.

a) The CCPA Decision Rejects the Accepted and Usual Standard of Judicial Review Expressly Subscribed to in CCPA Precedents.

The standard of judicial review to be followed by the CCPA is not articulated in 35 USC 141, 144, or any other statute, or any decision of this Court. The word "appeal"

as used in the statutes cited suggests the usual standard of judicial review rather than an independent and unreviewable decision on the facts of the case. The CCPA has, at times, subscribed to the accepted and usual standard of judicial review, *Hamer* v. *White,* 143 F.2d 987 (CCPA 1944), *Rodli* v. *Phillippi,* 154 F.2d 139, 140 (CCPA 1946), *Smith* v. *Hayward,* 176 F.2d 914, 923 (CCPA 1949), *Daley* v. *Wiltshire,* 293 F.2d 677 (CCPA 1961) and *Voisinet* v. *Coglianese,* 455 F.2d 1064, 1067 (CCPA 1972). In the *Hamer* case the court said (143 F.2d p. 990):

> "The board's responsibility in the case was analogous to that of a judicial trial tribunal, and, as an appellate tribunal, we are not at liberty to reverse its findings of fact unless convinced that such findings were clearly against the weight of the evidence.
>
> • • •
>
> Were we reversing the decision of the board it would be incumbent upon us to give a written review and point out the reasons for disagreement."

In the *Daley* case the CCPA reconfirmed the accepted and usual method of reviewing ultimate findings of fact (293 F.2d p. 681):

> "The question, however, is whether the record as a whole supports the board's conclusion, so that it is not manifestly wrong."

The present CCPA opinion does not analyze the record relating to the second segment of the critical period to determine whether the ultimate fact of Cricchi's diligence found by the Board was clearly against the weight of the evidence. Except for a reference to the time cards and Cricchi's own testimony, the opinion does not even recognize the existence of evidence supporting the Board's finding. The CCPA opinion states summarily (App. 8a):

> "Cricchi did not present any documentary evidence showing specific acts at specific times directed at a reduction to practice of the invention of the counts."

This statement flies in the face of the comprehensive, detailed and independently corroborated evidence of Cricchi's diligence. The CCPA's total disregard for the Board's summary of testimony supporting the holding of diligence (App. 20a, 21a) indicates that the CCPA no longer considers itself bound by the accepted and usual standards of judicial review.

b) The Evidence Pertinent to the Second Time Segment, October 1970 to September 1971.

On October 9, 1970 work was started at the Westinghouse Advanced Technology Laboratories in Baltimore, Md. on an integrated circuit memory array consisting of 256 MNOS memory transistors each embodying the invention (CX 13, TR 360, 459). The number "834", which identified the set of photographic masks needed to fabricate this MNOS array, was entered into the Westinghouse log book (CX 18) on October 23, 1970. Spicer received a request for the 834 mask set (CX 16) from Cricchi on October 20, 1970 and started to work on the 834 masks "within a day or two" (TR 575). His work included making accurate drawings, separating the drawings into the various levels corresponding to different steps in the fabricating process and then cutting the masks, one for each level of the process (TR 572, 573). His work corresponded to steps one through four in CX 101 (TR 575).

Another witness, Lancaster, was responsible for following the mask making activities in Spicer's area. He made the "834" entry in the log book (CX 18) and identified his "Job Summary for Mask Making Area" (CX 17) which showed the 834 mask series at step six in CX 101 on Janu-

ary 11, 1971 (TR 595). Lancaster gave a detailed explanation of the remaining steps in the mask making process and stated that a May 1, 1971 completion date for the photographic plates of the 834 mask series was "reasonable" (TR 600). He also authenticated a number of other documents (CX 21, 22, 27, 28, 30, 31, 32, 33, 36 and 37) relating to the making of the 834 mask series and dated in the period January-April 1971 (TR 600-610).

Ames was involved in the "making of masks from the reticle through the working plate processes" (TR 663) and identified his handwritten entries dated April 8, 1971 to April 20, 1971 relating to the 834 mask series in his contact printing log book (CX 20, CX 38, TR 664-5).

Ruehling was involved in building MNOS devices at Westinghouse, particularly the photoengraving steps (TR 454). He made tests on 834 wafers on June 3, 1971 (CX 45, TR 459) and stated that 834's were fabricated "at least as early as May and June of 1971" (TR 466). He identified CX 47, dated June 10, 1971 as the process sheet for the second lot of 834 devices (TR 465), and CX 102 as copies of the 834 mask set from which he made 834 arrays "in May of 1971" (TR 457, 490, 526). His testimony that each wafer he processed contained 69 active 834 arrays (TR 527) and that five wafers were in the first wafer lot he processed (TR 490) establishes that a total of 88,320 MNOS memory transistors each embodying the invention had been made at Westinghouse by June of 1971.

Shortly after work on the 834 mask series was initiated the Westinghouse Meter Division in Raleigh, North Carolina became interested in an automatic meter reading system (later identified as the 893 metering subsystem). Dr. Corak, who was Cricchi's supervisor, testified that "The heart of the 893 metering system is a ten-state counter

that has MNOS memory" (TR 344). The Meter Division initially authorized Cricchi to build up a counter with MNOS memory by using individual parts in a form approximating the integrated circuit which would be built at a later time, this assemblage of parts being known in the art as a Bread Board (CX 69, TR 235, 264). Ruehling testified that he built one Bread Board for the meter reading subsystem in March, 1971 (TR 466, 510) from the wiring diagram (CX 53) which Cricchi gave him, this Bread Board being introduced in evidence as CX III-1 (TR 404). Ruehling's testimony confirms Cricchi's own testimony that a Bread Board of the metering subsystem was built "shortly after March 1st, 1971" because they were "under pressure to build this particular device as soon as possible" and "had a commitment to our meter division to deliver the metering subsystem integrated circuits in July of 1971" (TR 236).

Britton was a design engineer at the Westinghouse Meter Plant in Raleigh, North Carolina. Under his supervision a second Bread Board of the proposed metering subsystem, CX III-2, was built (TR 392). Under covering letter dated July 7, 1971 (CX 1) Cricchi sent to Britton "10 packages of the 834 protected drain and source memory load element for your ten stage breadboard." Very shortly after receiving the 834 devices Britton built a ten stage counter incorporating the 834 devices. Britton operated the counter "in a nonvolatile manner" by the middle of August, 1971 (TR 416-418).

While Britton was building his counter in Raleigh and testing 834 devices in it, work proceeded in Baltimore on the integrated circuit known as the "893 metering subsystem chip" which also contained Cricchi's invention (TR 470). Lancaster identified the page of the Westinghouse log book (CX 50) which contained the entry of the 893

mask series (TR 609). Spicer identified five drawings dated from June 10, 1971 to July 11, 1971 (CX 46, 48, 54, 55 and 56) given to him by Cricchi "to generate a mask set" for the 893 integrated circuit (TR 566-568). Copies of the 893 mask layout (CX 60) dated July 28, 1971, the set of masks used for the 893 metering subsystem (CX 61) dated August 20, 1971, a list of "the major processing steps in sequence for the fabrication of the MNOS 893 metering subsystem" (CX 64) dated August 26, 1971, and the interconnection pattern for the 893 metering subsystem (CX 66) dated September 2, 1971 were also introduced (TR 258-264).

After Britton completed tests of the 834 arrays in his Bread Board at Raleigh in the middle of August, he built a CHIP tester "to functionally exercise the expected metering subsystem, the 893," (TR 419). Drawings of portions of the circuitry of the CHIP tester (CX 10) are dated August 31, 1971 and September 13, 1971 (TR 405-407).

By September 27, 1971 prototypes of the 893 integrated circuits had been made and tested so as to constitute "an actual reduction to practice of a device as defined in the counts of this interference on September 28, 1971" as found by the Board (App. 17a, 18a).

The CCPA's reversal of the Board's holding of reasonable diligence during the second segment of the critical period is predicated solely on what the Court regarded as the lack of probativeness of the time card charges (App. 7a-9a). However, the Board's holding of reasonable diligence had not been principally predicated on the time card charges but on its summaries of the testimony of witnesses (App. 20a, 21a) and on Naber's failure to challenge Cricchi's diligence during the second time segment (App.

22a). By reversing the Board's ultimate finding of diligence without giving "a written review and . . . [pointing] out the reasons for disagreement" with the Board, *Hamer* v. *White*, 143 F.2d p. 990, the CCPA deliberately departed from the usual and accepted standard of judicial review. Such departure is not authorized by the pertinent statutes, is not foreshadowed by the CCPA's own precedents, and calls for the exercise of this Court's power of supervision.

CONCLUSION

For the reasons set forth above, a writ of certiorari should issue to review the judgment and opinion of the CCPA.

Respectfully submitted,

CLEMENS HUFMANN
REGINALD K. BAILEY
20 North Wacker Drive
Chicago, Illinois 60606
Attorneys for Petitioner

Of counsel
MASON, KOLEHMAINEN,
RATHBURN & WYSS
20 North Wacker Drive
Chicago, Illinois 60606

JAMES B. HINSON
Westinghouse Electric Corporation
Patent Department
Churchill Borough
Pittsburgh, Pa. 15235

APPENDIX

APPENDIX

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

Thursday, December 22, 1977

Before: Markey, Chief Judge, Rich, Baldwin, Lane and Miller, Associate Judges.

No. 77-556. CHARLES T. NABER and GEORGE C. LOCKWOOD v. JAMES R. CRICCHI. Opinion by Miller, Judge. The decision of the Board of Patent Interferences awarding priority to the junior party Cricchi for an invention directed to an improved "drain-source-protected" metal-nitride-oxide-semiconductor (MNOS) device which can be used as a nonvolatile, electrically alterable memory element in various integrated circuits, is *reversed*.

UNITED STATES COURT OF CUSTOMS AND PATENT APPEALS

Appeal No. 77-556
Interference No. 98,566

CHARLES T. NABER and
GEORGE C. LOCKWOOD,

Appellants,

v.

JAMES R. CRICCHI,

Appellee.

DECIDED: December 22, 1977

MILLER, Judge.

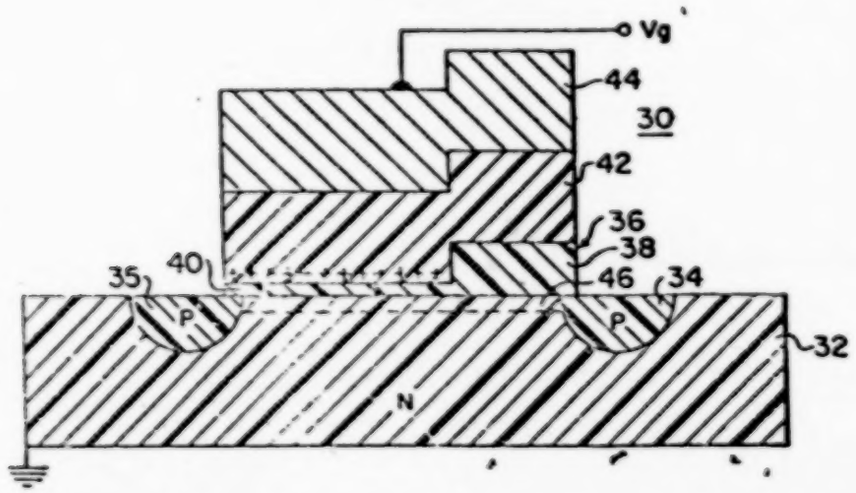
This appeal is from the decision of the Patent and Trademark Office Board of Patent Interferences (board) award-

ing priority of invention of the counts in issue to the junior party, Cricchi. The counts were copied by Cricchi[1] from a patent to Naber et al. (Naber) No. 3,719,866, issued March 6, 1973, and entitled "Semi-conductor Memory Device." The dispositive question, which the board decided in favor of Cricchi, is whether Cricchi was reasonably diligent from a time just prior to Naber's entry into the field (June 1970) until Cricchi's actual reduction to practice (September 1971). We reverse.

Subject Matter of the Counts

The invention is an improved "drain-source-protected" metal-nitride-oxide-semiconductor (MNOS) device which can be used as a nonvolatile, electrically alterable memory element in various integrated circuits. The specific improvement (illustrated by Figure 3 of the Naber patent) is that the silicon oxide layer (56) in the vicinity of the drain (54) and source (55) of the transistor is made thicker (shown at areas 58 and 60) than the corresponding layer in prior art devices.

Fig. 3



[1] In an amendment filed June 1, 1973, to his application serial No. 219,463, filed January 20, 1972, entitled "Enhancement Mode Limited MNOS Memory Device."

All of the counts include a recitation of this structure. Count 1 is illustrative and reads as follows:

Count 1

A metal-nitride-oxide-semiconductor device comprising:

a semiconductor material substrate of one conductivity having a first and a second region of opposite conductivity extending therein, said first and second regions being separated by a channel region having a channel formed therein through which majority carriers can flow from said first region to said second region, said first, second, and channel regions all extending from one surface of said substrate;

a layer of oxide material affixed to said one surface of said substrate to interface with the junction of said first region-channel region, said channel region, and the junction of said channel region-second region, said oxide layer having a first thickness in the vicinity of said first region-channel region junction and in the vicinity of said channel region-second region junction and a second thickness therebetween;

a layer of nitride material affixed to said oxide material and spaced apart from said substrate by said oxide material; and

a layer of conductor material affixed to said nitride material and spaced apart from said oxide material by said nitride material;

said first thickness being of more than a charge tunnel thickness to prevent any charge from tunneling between said oxide material-nitride material interface and said substrate-oxide material interface and said second thickness being of less than a charge tunnel thickness to allow charge to tunnel between said oxide material-nitride material interface and said substrate-oxide material interface.

Proceedings Below

The board found that Cricchi established conception of the subject matter of the counts on October 22, 1969, and concluded that the combined testimony of Cricchi's co-workers established——

> that at the time Cricchi conceived of the device . . . improvements were necessary in deposition processes of the oxide and nitride layers and that efforts to improve on the processes were part of a continuous program which extended from prior to October of 1969 into October of 1970.[2]

The board also found that Cricchi Exhibit 100, consisting of copies of time cards for four project numbers, "indicates reasonably continuous activity charged to the project numbers . . . used to identify the programs for constructing and testing the MNOS transistor" embodying the counts in issue. The board was not persuaded by Naber's argument that experiments directed at improving layer deposition techniques generally did not satisfy the "reasonable diligence" requirement, not being directed at construction and testing of the MNOS device of the counts. It said:

> [T]his work was required in order to reduce to practice the transistor conceived by Cricchi on October 22, 1969. Dr. Corak [Cricchi's supervisor] testified that improvement in the method of deposition was required in order to produce a useful device rather than a mere laboratory device.

In the Request for Reconsideration, Naber argued that Cricchi was not reasonably diligent during the period from June to October 1970 since work done then was directed at improving layer deposition techniques generally; further, that Cricchi Exhibit 100 was not proof of diligence during

[2] The program of improving deposition techniques was still going on in 1975 at Westinghouse, Cricchi's assignee.

the period from October 1970 to September 1971. The board adhered to its original decision.

OPINION

1. Work on Layer Deposition Techniques (June to October 1970)

The record shows that the work done at Westinghouse to improve oxide and nitride layer deposition techniques was generally applicable to all MNOS devices, not merely the "drain-source protected" device of the counts, and that this work had in fact commenced *prior* to Cricchi's conception of the invention. It is well settled that, to satisfy the "reasonable diligence" requirement of 35 USC 102(g), the work relied on must ordinarily be directly related to reduction to practice of the invention of the counts in issue. *Anderson* v. *Scinta*, 54 CCPA 1269, 372 F.2d 523, 152 USPQ 584 (1967); *Martin* v. *Snyder*, 41 CCPA 1010, 214 F.2d 177, 102 USPQ 306 (1954); *Gunn* v. *Bosch*, 181 USPQ 757 (Bd. Pat. Int'f 1973); *Moore* v. *Harris* v. *Hale*, 92 USPQ 187 (Bd. Pat. Int'f 1951). However, work in preparation for filing related patent applications may suffice (*e.g.*, *Rey-Bellet* v. *Englehardt*, 493 F.2d 1380, 181 USPQ 453 (CCPA 1974)), as may work required to develop a first invention in order to develop or reduce to practice a second invention (*e.g.*, *Keizer* v. *Bradley*, 47 CCPA 709, 270 F.2d 396, 123 USPQ 215 (1959); *Thompson* v. *Dunn*, 35 CCPA 957, 166 F.2d 443, 77 USPQ 49 (1948)).

There is no evidence that Cricchi's layer deposition techniques work was in preparation for filing related patent applications or was required to develop a first invention needed to proceed with the invention of the counts. Although the board found that "this work was required in order to reduce to practice" the invention of the counts,

both Cricchi and his supervisor admitted that a simple transistor embodying the structure embraced by the counts could have been built and tested for its memory characteristics.[3] Cricchi chose not to proceed to a reduction to practice with a simple transistor, but to wait until work on layer deposition techniques progressed.[4] Since he admittedly "possessed the capability of conducting such a test," it was his burden to reconcile the waiting period with the "reasonable diligence" requirement. *Litchfield* v. *Eigen*, 535 F.2d 72, 76, 190 USPQ 113, 116 (CCPA 1976).[5]

The board found, and Cricchi contends, that the work on layer deposition techniques was required to produce a "useful device," rather than a "mere laboratory device." However, there need not be commercial utility to have a reduction to practice. As this court said in *Goodrich* v. *Harmsen*, 58 CCPA 1144, 1153, 442 F.2d 377, 383, 169 USPQ 553, 559 (1971): "In the nature of things, testing goes on throughout the process of 'commercializing' and often con-

[3] Naber does not contend, nor would we agree, that Cricchi was under an absolute obligation to choose the simplest device embodying the structure of the counts to attempt a reduction to practice.

[4] Cricchi's brief contains the statement: "The fact that the demonstration device might have been constructed without doing this work [the process development work relating to layer deposition techniques] has been clearly recognized by Cricchi during all phases of this case."

[5] Public policy favors the early disclosure of inventions. This underlies the requirement for "reasonable diligence" in reducing an invention to practice, not unlike the requirement that, to avoid a holding of suppression or concealment, there be no unreasonable delay in filing an application once there has been a reduction to practice. See *Young* v. *Dworkin*, 489 F.2d 1277, 180 USPQ 388 (CCPA 1974).

tinues after a product is on the market where it usually receives its severest test." Acceptance of the proposition that the "reasonable diligence" requirement was satisfied, notwithstanding delay due to general work (on layer deposition techniques needed to produce a commercially-acceptable device), would, in effect, grant Cricchi a reservoir of "reasonable diligence" arising from work commenced prior to conception on October 22, 1969, and continuing into 1975. We are not persuaded that this accords with public policy favoring the early disclosure of inventions.

Cricchi's reliance on *Justus* v. *Appenzeller*, 177 USPQ 332 (Bd. Pat. Int'f 1971), is misplaced. In that case, a reduction to practice of the counts required a "bearing means" which Justus ordered to be custom made. Unforeseen circumstances delayed delivery of the bearings, with resultant delay in Justus' reduction to practice. Such circumstances are not present here. Cricchi had the materials and capability in June 1970 to produce a working MNOS memory device of the counts.[6]

We hold that work done at Westinghouse during the period from June to October 1970 directed at improving oxide and nitride layer deposition techniques generally applicable to all MNOS devices did not satisfy the requirement of "reasonable diligence" on the part of Cricchi.

2. Time Card Charges (October 1970 to September 1971)

Naber argues that Cricchi's testimony concerning the work performed under the four project numbers covered by time card charges of record is uncorroborated and, thus,

[6] On the record before us, the correctness of the board's conclusion, that such a device would have operated for only a "few hours" before failure, is questionable. In a proposal to the Air Force, Westinghouse indicated that it had developed an MNOS device early in 1969 that was operable for "greater than 1,000 hours."

cannot be used to show diligence; also, that work done under the project numbers after October 1970 was not directed at reducing to practice the invention of the counts.[7]

We are satisfied that at least some work done after October 1970 and charged to the project numbers had nothing to do with reducing to practice the invention of the counts. Thus, one Westinghouse employee (a Cricchi witness) testified that he did not begin working on the "834 device" (a device embodying the count limitations) until May 1971; but his time card charges show work done under the project numbers before that date.[8] This flatly contradicts testimony in the Cricchi record that if time was charged to the project numbers, the work being done was on the "834" project.

Naber's argument that Cricchi's uncorroborated testimony cannot satisfy the burden of showing "reasonable diligence" is well taken. *Kendall* v. *Searles,* 36 CCPA 1045, 173 F.2d 986, 81 USPQ 363 (1949). Cricchi did not present any documentary evidence showing specific acts at specific times directed at a reduction to practice of the invention of the counts. Instead, he relies on time cards showing work charged to four project numbers for this purpose. However, the time cards are not self-explanatory, and Cricchi's is the only testimony that undertakes to explain the work performed. Nothing in the record corroborates Cricchi's explanation. As pointed out above, testimony of

[7] Although appellants did not raise this issue in their main brief before the board, they did so in their Request for Reconsideration, and the board considered the argument in reaching its decision. Thus, the issue is properly before the court. Cricchi is incorrect in labeling the argument an improper new issue.

[8] Indeed, Cricchi admits this in his brief.

one of Cricchi's own witnesses contradicts his allegation that time charged to the project numbers was directed solely at a reduction to practice of the invention of the counts.

Accordingly, we hold that the time card charges of record and Cricchi's uncorroborated testimony concerning the work covered thereby do not satisfy Cricchi's burden of proving "reasonable diligence" during the period from October 1970 to September 1971.

3. Motion to Tax Costs

Naber has moved to assess printing costs against Cricchi for the portions of the transcript requested by Cricchi. These cover all of the testimony of Naber's witnesses. Cricchi states that his reason for including such testimony in the transcript was that Naber's Notice and Reasons of Appeal indicated that Naber would argue Cricchi's date of conception; that "[i]f Cricchi's date of conception was to be argued, this automatically raises the question of when did Naber et al. enter into the field."

Because Cricchi argued the issue of Naber's entry into the field before the board, it was not necessary for him to file a cross-appeal to preserve the issue for argument before this court. *Clauss* v. *Foulke,* 54 CCPA 1514, 379 F.2d 586, 154 USPQ 85 (1967). However, if that issue were to be argued before this court, it would have been Cricchi who would have raised the issue, Naber not having questioned the board's finding of Naber's date of entry into the field. Since the costs of printing the material necessary for the court to make a determination of the issues raised by appellee are normally assessed against appellee, *Meitzner* v. *Mindick,* 549 F.2d 775, 193 USPQ 17 (CCPA), *cert. denied,* 46 U.S.L.W. 3204 (October 4, 1977), Naber's Motion to Tax Costs to appellee Cricchi is granted.

The decision of the board awarding priority to Cricchi on counts 1-4 is *reversed.*

REVERSED

Final Hearing
March 18, 1976

Paper No. 50
SMU/dm

Mailed June 28, 1976—Patent & Trademark Office

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT INTERFERENCE

Patent Interference No. 98,566

Cricchi v. Naber, et al.

Semiconductor Memory Device

Application of James R. Cricchi filed January 20, 1972, Serial No. 219,463.

Patent granted Charles T. Naber and George C. Lockwood March 6, 1973, Patent No. 3,719,866, Serial No. 94,861 filed December 3, 1970.

Henson, Schron, O'Rourke, Renz, Hinson and Murray for Cricchi. Oral argument by James B. Hinson.

Cavender, Benjamin, Schellin and Stansbury for Naber, et al. Oral argument by Lawrence P. Benjamin.

Champion, Forrer and Urynowicz, Examiners of Interferences.

Urynowicz, Examiner of Interferences.

The invention at issue in this interference relates to a metal-nitride-oxide-semiconductor memory element which

exhibits the characteristic of being able to store charge to vary its threshold voltage. The oxide layer has thick portions in the vicinity of the drain and source regions of the element and a thin portion therebetween. The thick portions are provided to prevent low voltage breakdown of the drain-substrate and source-substrate diodes. The issue consists of four counts which read as follows:

Count 1

A metal-nitride-oxide semiconductor device comprising:

a semiconductor material substrate of one conductivity having a first and a second region of opposite conductivity extending therein, said first and second regions being separated by a channel region having a channel formed therein through which majority carriers can flow from said first region to said second region, said first, second, and channel regions all extending from one surface of said substrate;

a layer of oxide material affixed to said one surface of said substrate to interface with the junction of said first region-channel region, said channel region, and the junction of said channel region-second region, said oxide layer having a first thickness in the vicinity of said first region-channel region junction and in the vicinity of said channel region-second region junction and a second thickness therebetween;

a layer of nitride material affixed to said oxide material and spaced apart from said substrate by said oxide material; and

a layer of conductor material affixed to said nitride material and spaced apart from said oxide material by said nitride material;

said first thickness being of more than a charge tunnel thickness to prevent any charge from tunneling between said oxide material-nitride material interface and said substrate-oxide material interface and said second thickness being of less than a charge tunnel thickness to allow charge to tunnel between said oxide material-nitride material interface and said substrate-oxide material interface.

Count 2

The invention according to count 1 wherein said semiconductor material is silicon, said oxide material is silicon oxide, said nitride material is silicon nitride, and said conductor material is aluminum.

Count 3

The invention according to count 2 wherein the first thickness of said silicon oxide material is between 200 and 1,000 Angstroms, the second thickness of said silicon oxide material is between 15 Angstroms and 60 Angstroms, and the thickness of said silicon nitride material is between 400 Angstroms and 1,000 Angstroms.

Count 4

The invention according to count 2 wherein the first thickness of said silicon oxide material is approximately 400 Angstroms, the second thickness of said silicon oxide material is approximately 30 Angstroms, and the thickness of said silicon nitride material is approximately 750 Angstroms.

On October 17, 1974, Naber et al. filed motions under 37 CFR 1.231 to dissolve this interference as to all the counts (Paper No. 9). On November 5, 1974, the Patent Interference Examiner dismissed the motions in view of the fact they were not filed within the time set in Paper No. 3 and were not accompanied by an affidavit showing

of facts to justify excusing their belatedness (Paper No. 10). No other motions were filed. Both parties took testimony, filed briefs, and appeared at the final hearing. As junior party who filed this application prior to issuance of the senior party's patent, Cricchi has the burden of proving priority as to the counts by a preponderance of the evidence. Archer v. Gordon v. Freter, 426 F.2d 1402, 166 USPQ 322 (CCPA 1970).

This interference was declared with the junior party's application containing a showing under Rule 204(c). In declaring the interference, no order to show cause under Rule 228 was entered.

Naber et al. argue in their brief that they are entitled to either Summary Judgment or an award of priority due to a fatally defective Affidavit under Rule 204(c) in that the Junior Party Cricchi has failed to set forth facts of an invention, or in the alternative, has failed to set forth facts of an invention prior to the filing date of the Senior Party, and has failed to show or set forth facts indicating how he meets the counts of the interference.

The Commissioner of Patents in Walsh et al v. Sakai et al., 167 USPQ 465 (1970) held that:

> The examination of a showing under Rule 204(c) is essentially ex parte in nature as an incident to the declaration of interference. Rule 228 makes specific detailed provisions for the procedure to be followed if an order to show cause is entered because the ultimate substantive rights of the junior applicant are affected. However, there is no provision for the senior patentee to seek such an order because the ultimate substantive rights of the senior patentee are not affected. In essence, the nonentry of the order is merely a ruling that "the interference will proceed in the normal manner." The summary judgment stage

> under Rule 228 having been passed, there is no occasion for reversion to that stage at the behest of the senior patentee."

In view of the above holding, we are of the opinion that Naber et al. are not entitled to a review of the Rule 204(c) showing made by Cricchi.

Cricchi contends that the record submitted on his behalf establishes that he conceived the subject matter of the counts prior to the earliest date of conception (May 11, 1970) alleged by Naber et al., that he actually reduced his invention to a practice as early as June 28, 1971, and that he has exercised reasonable diligence from a time just prior to Naber et al.'s entry into the field to his actual reduction to practice.

Cricchi testified that he has a bachelor of science degree in electrical engineering and that he has been employed by Westinghouse Electric Corporation (Westinghouse) in Baltimore, Maryland since 1953. With respect to his alleged conception, Cricchi testified that his Exhibit 12 is a proposal Westinghouse submitted to the Air Force Avionics Laboratory prepared in September-October of 1969, and that Figure 2-28B on page 2-53 shows the MNOS transistor which he conceived which was to eliminate the problems of high electric fields in areas between the gate and the drain, and the gate and the source.

Dr. William C. Corak testified to the effect that he has been employed by Westinghouse in Baltimore, Maryland since October of 1947, that he presently is Manager of Solid State Technology in the Science and Technology Department of the Systems Development Division, and that he has supervised Cricchi approximately since 1966. Dr. Corak indicated that Cricchi Exhibit 12 is a technical proposal prepared in September-October of 1969 by Westing-

house for the United States Air Force of which Cricchi was the primary author or technical person responsible, that he read and understood the proposal at the beginning of October of 1969, that Cricchi told him the structure illustrated in Figure 2-28B of page 2-53 was his idea, and that Cricchi explained the advantages of the stepped oxide structure to him at that time.

Cricchi Exhibit 12 bears the date October 22, 1969. Figure 2-28 of page 2-53 illustrates the cross-section of an MNOS device having an N type silicon substrate with P type regions diffused at the upper surface thereof forming a source and a drain, a dual thickness silicon oxide layer located directly above the substrate and overlapping the source and drain regions, a layer of silicon nitride located directly above the silicon oxide layer, and a layer of material located above the silicon nitride forming a gate electrode. Thicknesses for the dual thickness silicon oxide layer are given as ranges of 20-40A and 100-200A. Page 2-54 of Cricchi Exhibit 12 gives further thickness ranges for MNOS memory structures of 200-300A for oxide layers and 750-1500A for nitride layers.

In their brief Naber et al. argue that the testimony of Dr. Corak is based on information derived solely from the inventor, Cricchi, and is not of his own personal knowledge and accordingly, this testimony can be afforded no weight to corroborate the alleged conception by Cricchi. In support of their position, Naber et al. cite Anderson et al. v. Crowther et al., 152 USPQ 504 (Bd. Pat. Int. 1965) and Thurston v. Wulff et al., 35 CCPA 794, 164 F.2d 612, 76 USPQ 121 (1947).

We are not persuaded by the above argument of Naber et al. The cases relied upon by Naber et al. relate to corroboration of an actual reduction to practice, not to cor-

roboration of conception by an inventor which is here at issue. It is well established that the fact that an oral disclosure was made at an alleged time must be proved by the testimony of the person to whom the disclosure was made or of some one who overheard the disclosure. Townsend v. Smith, 17 CCPA 647, 36 F.2d 292, 4 USPQ 269 (1930). Here, the fact that an oral disclosure was made by Cricchi is proved by the testimony of Dr. Corak to whom the disclosure was made. Additionally, the evidence herein indicates that someone at Westinghouse had the complete concept and that the originator seems to have been Cricchi. There is no evidence to the contrary. Bedford v. Boothroyd et al., 51 CCPA 713, 319 F.2d 200, 138 USPQ 42 (1963). Accordingly, we are of the opinion that Exhibit 12 of Cricchi, as testified to by Cricchi and the corroborating witness, Dr. Corak, is adequate to establish conception of the subject matter of the counts in issue on October 22, 1969, the date of the above Exhibit 12.

With respect to actual reduction to practice of the device conceived on October 22, 1969, Cricchi testified to the effect that the MNOS device illustrated in Figure 2-28B of his Exhibit 12 was used to construct a memory array known as the 834, that his Exhibit 51 shows test results taken from the array, and that the test results indicate the memory would operate for its intended purpose. Exhibit 51 is dated July 1, 1971.

Dr. Corak indicated that the 834 is a matrix array comprising the MNOS elements illustrated in Figure 2-28B of Cricchi Exhibit 12 and that the 893 is the designation given to a metering system at Westinghouse, the heart of which is a ten stage counter that has the MNOS memory which is shown in Figure 2-28B of Cricchi Exhibit 12. Dr. Corak further indicated that Cricchi Exhibit 51 is a record in Cricchi's handwriting.

James Britton testified to the effect that he was a design engineer at the Westinghouse Meter Plant in Raleigh, North Carolina, that Cricchi Exhibit 11 is a report of a trip made by Cricchi to the Westinghouse Metering Division in Raleigh, on September 27 and 28, 1971, that during this visit the counters in 893 devices having the MNOS memory were tested by Cricchi and himself by rapid power cycling, removal of the power to the counters, removal of the memory from the circuit, insertion of the memory back into the circuit, reapplication of the power, and sensing of the memory state. The memories were found to retain their original states even though power had been removed for as long as an hour. Britton further testified to the effect that the memories had to retain their states for more than 15 minutes to be considered good devices.

We are of the opinion that the record submitted by Cricchi is inadequate to establish an actual reduction to practice of the apparatus defined by counts in July of 1971, the date of Cricchi Exhibit 51. It is well-established that to establish an actual reduction to practice, the testimony of an inventor must be corroborated and that records prepared by an inventor are merely self-serving documents which, standing alone, do not effect such corroboration. Searle v. Glarum et al., 37 CCPA 896, 199 F.2d 874, 84 USPQ 454 (1950). Dr. Corak did not indicate that he witnessed and understood tests performed by Cricchi in July of 1971 but merely that Exhibit 51 was in Cricchi's handwriting. Exhibit 51, being a record prepared by the inventor, stands alone, and is merely a self-serving document which does not effect corroboration.

In view of the testimony of Britton, the content of Cricchi Exhibit 11 referred to therein and the lack of opposition of the party Naber et al., we are further of the opinion that Cricchi has established an actual reduction to

practice of a device as defined in the counts of this interference on September 28, 1971, the latter date of Cricchi's recorded trip to Raleigh, North Carolina which appears in Exhibit 11.

Since he has established conception prior to any date alleged by Naber et al. and has established an actual reduction to practice after the filing of the Naber et al. application on December 3, 1970, a constructive reduction to practice, Cricchi can prevail only if he has established reasonable diligence from a time just prior to Naber et al.'s entry into the field until his actual reduction to practice on September 28, 1971. Naber et al. contend that they conceived the invention as defined in the counts, and therefore entered the field, in June of 1970.

In support of their contention as to conception, Naber et al. rely on testimony by Naber and Herman E. Austen, an engineer who shared the same office with Naber at National Cash Register Corporation (NCR) and Naber et al. Exhibit 1. Both Naber and Austen testified as to the content of Exhibit 1 and as to the fact that they signed Exhibit 1 on June 2, 1970. Examination of Exhibit 1 reveals that an MNOS device having two insulator thicknesses in the gate region is disclosed therein. The insulator is disclosed as thicker over the drain area of the device than it is over the channel and source areas. In comparison, the counts require an MNOS device having thick oxide portions over the drain and source regions and a thinner oxide over the channel portions. It is well-established that a disclosure relied on for conception must show every essential element of the invention as defined in the count of the interference. Cislak v. Wagner, 42 CCPA 70, 215 F.2d 275, 103 USPQ 39 (1954). Here it is clear that the disclosure of Naber et al. Exhibit 1 does not show

every essential element of the invention as defined in the counts in that it does not show a thicker portion of oxide over the source area. Accordingly, Exhibit 1 of Naber et al. and the above testimony relating thereto are inadequate to establish conception by Naber et al. of the device as defined in the counts on June 2, 1970.

Naber et al. further rely on an Invention Disclosure Record, Naber et al. Exhibit 26, signed and witnessed on September 22, 1970, in order to establish conception of the device as defined in the counts. However, since Naber et al. have submitted other documentary evidence as to an actual reduction to practice having an earlier date, we will first discuss the sufficiency of this evidence as it relates to Naber et al.'s entry into the field.

John K. Stewart, Jr. testified that he was first employed by NCR on July 11, 1966. He indicated that he began working for Naber in 1968-1969 doing photo resist work and some electrical testing. He testified to the effect that he made Naber et al. Exhibit 2 at Naber's direction, that Exhibit 2, dated June, 1970, shows nine MNOS transistors having different gate structures, that #1 is a tri-gate transistor and that #2 is a standard non-memory transistor. Stewart described the tri-gate transistor as having its memory portion centered between the source and drain, and having the thinner oxide in the center and the thicker oxide overlapping the source and drain. In June of 1970, Stewart noted the thinner oxide was less than 100 Angstroms and the thicker oxide was around 800 Angstroms. He indicated that Exhibits 47 and 48 of Naber et al. show test data that he took from transistors on wafers having the structure shown in Exhibit 2.

After careful consideration we are of the opinion that Exhibit 2 of Naber et al. and the testimony of John K. Stewart, Jr. relating thereto are adequate to establish

that Naber et al conceived the invention as defined in counts 1-4 in June of 1970 and thus entered into the field at that time. Accordingly, discussion of Naber et al.'s further proofs as to conception which relate to a period after June 1970 is unnecessary.

In an attempt to establish reasonable diligence, Cricchi relies on testimony by himself, associates at Westinghouse, and numerous exhibits. Cricchi indicated that during October of 1969 and beyond, he was doing continuous work directed toward fabrication of the device illustrated in Figure 2-28B of his Exhibit 12 involving different processes for depositing nitride and oxide films of different thicknesses. He indicated this work continued through October of 1970 and was necessary to fabrication of the device shown in Figure 2-28B. He testified to the effect that in the latter half of 1970 a mask set for an array which incorporated the memory of the above-noted figure was developed, that this work was begun by Kenneth Douglas Spicer and Edgar Dale Lancaster, Jr., both of whom were employed at Westinghouse, around October 23, 1970, that it took about six months to produce an actual memory device and that numerous tests were performed on the memory device in the middle and latter portions of 1971.

According to the testimony of Kenneth Douglas Spicer, a technician in the Environmental Test Area of Westinghouse in Baltimore, Maryland, mask sets for the Cricchi 834 and 893 devices were built beginning October of 1970 continuing into March of 1971. His testimony indicates that it took about ten weeks for him to complete the steps of the mask making process which he was required to perform.

Edgar Dale Lancaster, Jr. indicated that in the period 1969-1972 he was an assistant engineer at Westinghouse in Baltimore, Maryland supervising mask-making processes

and that he was involved in making mask sets identified as the 834 and 893. He further indicated that the process of making these masks began in October of 1970 and extended into May of 1971 as part of a continuous effort, and testified as to the type of work that was done during specific portions of the above period.

It appears from the testimony of John Carlson Ames that in the period from mid-1969 to early 1972 he was working in the Solid State Laboratory Group in the mask-making facility of Westinghouse and was responsible for the processing involving the making of masks from the reticle through working plate processes. Ames testified as to specific dates in April of 1971 wherein 834 masks were made by production-line people who did contact printing.

Fred Nagel testified that in the period of 1970 and 1971 he was responsible for packaging of semiconductor devices at Westinghouse. He indicated that in mid to late 1971 he was packaging 834 devices for Ronald Cricchi and identified devices that were packaged no later than September or October of 1971.

The combined effect of the testimony of Dr. Corak, James Britton, and Barry W. Ruhling, who worked for Cricchi at Westinghouse processing and testing MNOS devices, is that at the time Cricchi conceived of the device of Figure 2-28B of his Exhibit 12, improvements were necessary in deposition processes of the oxide and nitride layers and that efforts to improve on the processes were part of a continuous program which extended from prior to October of 1969 into October of 1970. Their testimony further indicates that in the period June of 1971 through September of 1971 numerous tests were performed on the MNOS devices which were included in 834 arrays and 893 metering systems.

Walter Tolj testified that he was Financial Manager for Engineering at Westinghouse and indicated that Cricchi Exhibit 100 includes reproduced copies of the original time cards turned in by engineers whose names appear at the top of the cards.

For the critical period extending from just prior to Naber et al.'s entry into the field in June of 1970 until his actual reduction to practice on September 28, 1971, Cricchi Exhibit 100 indicates reasonably continuous activity charged to the project numbers 60605CG, 60605DG, 61605CG, and 61605DG, which numbers were used to identify the programs for constructing and testing the MNOS transistor of Figure 2-28B of Cricchi Exhibit 12.

In their brief Naber et al. argue that the experiments at Westinghouse from just prior to June, 1970 into October, 1970 relating to improvements in the process of depositing oxide and nitride layers cannot be relied upon by Cricchi to establish diligence since the experiments concern improvement in the method of depositing layers generally, not the construction and testing of the MNOS transistor at issue. In support of their position Naber et al. cite Gunn v. Bosch and Pollmann, 181 USPQ 759, (1973). Naber et al. have not argued that the proofs relied on by Cricchi do not establish reasonable diligence for the remaining portion of the critical period in question.

After careful consideration, we are of the opinion that Cricchi has established reasonable diligence from just prior to Naber et al.'s entry into the field in June of 1970 until his actual reduction to practice on September 28, 1971. We are not persuaded by the argument set forth by Naber et al. above. Although the work by Cricchi into October of 1970 did not consist of the construction of the MNOS device as defined in the counts, it is clear from the testi-

mony of Dr. Corak, and Dr. James Kendall, one of Naber et al.'s own witnesses, that this work was required in order to reduce to practice the transistor conceived by Cricchi on October 22, 1969. Dr. Corak testified that improvement in the method of deposition was required in order to produce a useful device rather than a mere laboratory device. Dr. Kendall testified to the effect that in 1968, everyone in the field still had a great deal of work to do in order to obtain good oxide and nitride layers and that in 1969 those problems had been solved at NCR. Dr. Kendall indicated he was aware of what Westinghouse was doing and at that time it appeared that they had not solved the deposition problems.

In view of our findings that Cricchi has established conception of the subject matter of the counts in issue on October 22, 1969, that he actually reduced the invention to practice on September 28, 1971, and that he was reasonably diligent from a time just prior to Naber et al.'s entry into the field in June of 1970 until his actual reduction to practice, Cricchi, the junior party, is entitled to prevail.

Priority of invention of counts 1-4 is hereby awarded to James R. Cricchi, the junior party.

Marvin A. Champion
Examiner of Interferences
Donald D. Forrer
Examiner of Interferences
Stanley M. Urynowicz, Jr.
Examiner of Interferences
Board of Patent Interferences

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT INTERFERENCES

Patent Interference No. 98,566

Cricchi v. Naber et al.

Reconsideration

Champion, Forrer and Urynowicz, Examiners of Interferences.

Urynowicz, Examiner of Interferences.

Naber et al. have filed a petition under 37 C.F.R. 1.256(b) for reconsideration of that portion of our decision of June 27, 1976 holding that Cricchi, the junior party, was reasonably diligent from a time just prior to Naber et al.'s entry into the field in June of 1970 until his actual reduction to practice on September 28, 1971. On October 13, 1976, Cricchi filed a response to the Naber et al. petition for reconsideration. On October 26, 1976 Naber et al. filed a rejoinder brief and Cricchi filed a response to the rejoinder brief on November 3, 1976.

The rejoinder brief and response thereto have been given no consideration as they are not provided for under 37 C.F.R. 1.256(b).

In their petition for reconsideration, Naber et al. urge that the testimony of Cricchi, Dr. Corak and Dr. Kendall does not support the Board's conclusion that the June-

October 1970 work to improve the technology of silicon dioxide and silicon nitride thin film formation was necessary to actually reduce the memory transistor to practice. We consider that due to the uncertainties involved in the formation of nitride and oxide films at the time in question Cricchi's work in attempting to remove these uncertainties comprises a necessary and expeditious program, and reasonable diligence toward actually reducing the device defined by the counts to practice. The testimony of Cricchi and Dr. Corak, taken as a whole, indicates that even though the device at issue possibly could have been built without the additional work on layer formation, the technology had not been developed at Westinghouse to the point where such devices could have been constructed with the expectation that they would exhibit the necessary properties and characteristics required of memory devices. Although the testimony of Dr. Kendell indicates that even without solving the nitride problems one could still make devices which would last for a few hours, this testimony does not establish that the devices would have memory retentivity of a few hours or any significant memory retentivity at all, but merely that memory devices could operate for a few hours before they would fail. It is apparent that transistors of such limited life expectancy cannot be deemed of any practical memory use and therefore operable devices. In contrast, memory devices built after the June-October 1970 work on layer formation were tested and deemed satisfactory for use in the 893 system. Cricchi's witness, Britton, subjected these devices to diverse tests, i.e. memory retention with rapid power cycling and memory retention with power off. At this time, Cricchi concluded that all of the subsystems of the 893 device were operating correctly (Cricchi Exhibit 11).

The patents attached to Naber et al.'s petition were not part of their record at final hearing and were not considered by us at that time. Accordingly, they have been given no consideration herein as they are not subject matter for reconsideration.

Naber et al. raise a new issue in their petition urging that the appearance of Project Number Z61605CG on Cricchi Exhibit 73 suggests that much work not related to a reduction to practice of the subject matter of the counts was in fact performed by Cricchi or in his behalf during the critical period. We are of the opinion that Cricchi Exhibit 73 alone is inadequate to establish the above conclusion urged by Naber et al. By itself Exhibit 73 does not evidence that much work unrelated to a reduction to practice of the 834 arrays was charged to the project numbers appearing in Cricchi Exhibit 100. At best it merely suggests the possibility that this could have occurred. However, the testimony in the Cricchi record is clear that only work related to the construction and testing of the 834 device was charged to the project.

Accordingly, the petition of Naber et al. is granted to the extent of reconsidering our decision but is denied to the extent of making any changes therein.

Marvin A. Champion
Examiner of Interferences
Donald D. Forrer
Examiner of Interferences
Stanley M. Urynowicz, Jr.
Examiner of Interferences
Board of Patent Interferences

BELL TELEPHONE LABORATORIES, INCORPORATED

v.

HUGHES AIRCRAFT COMPANY, Appellant, and General Instrument Corporation.

No. 77-1061.

United States Court of Appeals, Third Circuit.

Argued Sept. 6, 1977.

Decided Oct. 25, 1977.

OPINION OF THE COURT

MARIS, Circuit Judge.

This is an appeal by Hughes Aircraft Corporation (herein "Hughes") from a final judgment of the district court in favor of the plaintiff in an action brought by Bell Telephone Laboratories, Inc. (herein "Bell") against Hughes and General Instrument Corporation to establish priority of invention as among their conflicting patents. Judgment by default having been entered against General Instrument Corporation, it is no longer involved in the case. Bell and Hughes hold interfering patents claiming the same invention, the Bell patent being Patent No. 3,475,234 applied for March 27, 1967 by Robert E. Kerwin, Donald L. Klein and John C. Sarace and issued October 28, 1969 to Bell as assignee, and the Hughes patent being Patent No. 3,544,399 applied for October 26, 1966 by Hans G. Dill and issued December 1, 1970 to Hughes as assignee. The judgment of the district court awarded priority of invention to Bell over Hughes and it is that determination which Hughes attacks on this appeal.

The invention involves a process for manufacturing a type of electronic amplifying device commonly known as a silicon gate field effect transistor. Hughes concedes, and

the district court found, that the invention was conceived by Bell's inventors in the period February-March 1966 and that Dill, the Hughes inventor, did not conceive the invention until May of that year. However, the parties also agree and the district court found that reduction to practice of Dill's invention took place not later than October 26, 1966 when he filed his patent application, whereas Hughes contended and the court found that reduction to practice of the Kerwin, Klein and Sarace invention did not take place until the period December 1966-January 1967. Therefore, in order to establish its claim to priority Bell sought to prove that it had exercised reasonable diligence in reducing the invention to practice.[1] The district court after considering the voluminous evidence offered on this issue found as a fact that Bell had exercised reasonable diligence in this regard during the significant period of time, May to December, 1963, and awarded priority of invention to Bell. A more detailed description of the facts is contained in the opinion filed by Judge Wright in the district court, 422 F.Supp. 372, and need not be repeated here. Whether the finding of reasonable diligence was erroneous is the specific issue which Hughes raises on this appeal.

---

[1] 35 U.S.C. § 102 provides:

A person shall be entitled to a patent unless—

(g) before the applicant's invention thereof the invention was made in this country by another who had not abandoned, suppressed, or concealed it. In determining priority of invention there shall be considered not only the respective dates of conception and reduction to practice of the invention but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

The appellant accepts, as it must, the fact that Rule 52(a) F.R.C.P. requires this court to affirm the findings of fact of the district court unless we can say that they are clearly erroneous. Whether reasonable diligence has been exercised is a question of fact. *Electro-Metallurgical Co.* v. *Krupp Nirosta Co.*, 122 F.2d 314, 317 (3d Cir. 1941), *cert. denied*, 314 U.S. 699, 62 S.Ct. 480, 86 L.Ed. 559 (1942). Hughes contends, however, that the application of Rule 52(a) must be modified in this case and presents three arguments in support of that contention. First, it argues that the district court misconceived and misapplied the applicable legal standard as to what work constitutes reasonable diligence in such a situation. It is doubtless true that work quite unconnected with the reduction of an invention to practice cannot be considered.[2] But whether particular work is sufficiently connected with the invention to be considered to be in the area of reducing it to practice must be determined in the light of the particular circumstances of the case which may be as varied as the mind of man can conceive. It is thus peculiarly a question of fact for the finder of the facts to determine in the light of those circumstances. Here the district court found that the work performed by Bell was sufficiently within that area to constitute reasonable diligence. Our consideration of the record satisfies us that this finding was not erroneous, let alone clearly so.

The appellant next argues that as a matter of law Bell should not be found diligent in view of the fact that after June 1966 it cut back the number of staff members assigned to work on the invention. As to this, the record

---

[2] *Riche* v. *Permutit Co.*, 47 F.Supp. 275 (D.Del. 1942), *affirmed per curiam*, 135 F.2d 922 (3d Cir. 1943), upon which the appellant relies, was such a case.

shows, and the district court found, that probe testing in June 1966 indicated that the device produced by the process of the invention functioned successfully. What remained was the work of developing the process to a point where it would produce a commercially usable device, a task which did not necessarily require the work of as many staff members. Here again the question was one of fact for determination by the fact finder. We see no error in the district court's resolution of it.

Finally, the appellant urges that the district court should not have considered as evidence of reasonable diligence the oral recollection of the inventors uncorroborated by documentary evidence. While it has been held that the uncorroborated testimony of an inventor on essential issues of priority is highly suspect and such testimony should, therefore, generally be supported by corroborating evidence, *Campbell* v. *Spectrum Automation Co.*, 513 F.2d 932, 937-938 (6th Cir. 1975); *Gould* v. *Schawlow*, 363 F.2d 908, 919, 53 CCPA 1403 (1966), the corroborating evidence need not take any particular form, *MacMullen* v. *Santelli*, 326 F.2d 1008, 1013, 51 CCPA 978 (1964), but may be either documentary or oral, *Allen* v. *Blaisdell*, 196 F.2d 527, 529, 531, 39 CCPA 951 (1952). Since the function of the corroborating evidence is to assist the fact finder in deciding whether the inventor's testimony is credible, the question whether its amount and quality is adequate for that purpose is peculiarly for the fact finder to pass upon in the light of the circumstances of the case. *Mathieson Alkali Works* v. *Crowley*, 78 U.S.App.D.C. 163, 164, 138 F.2d 281, 282 (1943); *Bennett* v. *Serota*, 477 F.2d 1385, 1390-1391 (Cust. & Pat.App. 1973). Here the district court found that the testimony of the Bell inventors as to their work in reducing their invention to practice was sufficiently supported by corroborating evidence to be credited. We find no error in this regard.

In sum, we conclude from our examination of the record in this case that the district court did not err in its finding that Bell was reasonably diligent in reducing its invention to practice. Accordingly, its determination that Bell as first inventor is entitled to priority for its patent must be sustained. Our conclusion makes it unnecessary for us to consider Bell's alternative contention in support of affirmance that it reduced its invention to practice in June 1966 when it made its successful probe tests, a date prior to Hughes' reduction to practice.

The judgment of the district court will be affirmed.

BELL TELEPHONE LABORATORIES, INCORPORATED, Plaintiff,

v.

HUGHES AIRCRAFT COMPANY and General Instrument Corporation, Defendants.

Civ. A. No. 74-238.

United States District Court, D. Delaware.

July 19, 1976.

OPINION

CALEB M. WRIGHT, Senior District Judge.

Plaintiff, Bell Telephone Laboratories, Inc. ("BTL"), seeks relief under 35 U.S.C. § 291[1] against defendants

[1] 35 U.S.C. § 291 provides:

The owner of an interfering patent may have relief against the owner of another by civil action, and the court may adjudge the question of the validity of any of the interfering patents, in whole or in part. The provisions of the second paragraph of section 146 of this title shall apply to actions brought under this section.

Hughes Aircraft Co. ("Hughes") and General Instruments Corp. ("G.I."). BTL alleges that an interference exists between its United States Letters Patent Number 3,475,234 (the Kerwin patent), and United States Letters Patent Numbers 3,544,399 (the Dill patent) and 3,576,478 (the Watkins patent), owned by Hughes and G.I. respectively. BTL seeks an adjudication of that interference and a declaration that it is the sole owner of the patent rights in interference.

This Court has jurisdiction under 28 U.S.C. § 1338 (a). Since plaintiff, BTL, is a New York corporation and both defendants are Delaware corporations venue is proper under 28 U.S.C. § 1391(c). *Cf., Standard Oil Co.* v. *Montecatini Edison, S.p.A.,* 342 F.Supp. 124 (D.Del. 1972).

Previously this Court has entertained a suit in which Hughes charged General Instruments with infringement of the Dill patent. General Instruments defended on the grounds, *inter alia,* that the Dill patent was invalid by reason of Watkins' prior invention. After separate trial on this priority issue, this Court held that although Watkins had conceived the invention in March of 1965, Watkins did not reduce the invention to practice until the filing of a patent application on November 17, 1966. Dill, however, was found to have conceived on May 1, 1966, and to have reduced to practice constructively by the filing of a patent application on October 26, 1966. Since Watkins was the first to conceive but the last to reduce to practice, his diligence from Dill's conception until his own filing was necessary to a finding that he was the prior inventor. No such diligence was found and Hughes prevailed. *See Hughes Aircraft Co.* v. *General Instruments Corp.,* 374 F.Supp. 1166 (D.Del. 1974). Before further proceedings on the remaining validity and infringement issues in that case occurred, the present suit was filed by BTL.

At an early stage in these proceedings, Hughes moved for dismissal on the ground that no interference existed. This Court was unwilling to hold on the record then extant that the patents were non-interfering. Accordingly that motion was denied. 185 U.S.P.Q. 660. G.I. participated in the briefing of that motion and urged that a three-way interference existed. However, as a result of a settlement agreement with Hughes, G.I. ceased participating in these proceedings prior to the argument on the Hughes' motion. *See* 185 U.S.P.Q. at 661.

Following denial of the dismissal motion, Hughes dropped its position that the Kerwin and Dill patents were non-interfering and the case proceeded to trial on the merits. The matter is now ready for decision.

The purpose of a suit under 35 U.S.C. § 291 is to establish priority of invention as between patentees. Priority is determined by the standard found in 35 U.S.C. § 102(g):

> . . . In determining priority of invention, there shall be considered not only the respective dates of conception and reduction to practice of the invention, but also the reasonable diligence of one who was first to conceive and last to reduce to practice, from a time prior to conception by the other.

In the instant suit, the parties have stipulated to the Hughes dates determined by this Court in the *Hughes* v. *General Instrument* infringement action.[2] The parties therefore presented this Court with proofs only respecting BTL's dates of conception and reduction to practice. In the event that the Court were to determine that the Ker-

[2] The Dill invention was conceived on May 1, 1966, and reduced to practice with the filing of the patent application on October 26, 1966.

win invention was conceived prior to May, 1966, and reduced to practice after October 26, 1966, BTL also sought to show that the Kerwin inventors exercised diligence from prior to May 1966 until such time as they had achieved a reduction to practice.[3]

The invention in the priority contest is directed to a semi-conductor device known as a "silicon-gate field effect transistor". ("S.G.F.E.T."). A field effect transistor ("F.E.T.") is a three-electrode electronic amplifier formed in a small semi-conductor. The semi-conductor is usually silicon and is referred to as a "slice", "chip", or "wafer". The three electrodes are known as the "source", "drain", and "gate". The source and the drain electrodes are formed in the silicon wafer by "doping" selected portions of the wafer with selected impurities. The area separating the source and drain is known as the "channel", and normally will resist the flow of current. However, in an F.E.T., the channel is overlayed with an insulating layer, and the gate electrode is formed on top of that layer. When an appropriate voltage is applied to this gate, current is able to flow along the previously resistant path between the source and drain. Further, variations in the voltage applied to the gate will result in variations in the current flowing between the source and drain.

---

[3] BTL did not attempt to prove a date of conception prior to March of 1965, the date of conception awarded to G.I., 374 F.Supp. 1171. However, since BTL was not a party to the prior suit, it is not bound by any of this Court's findings in that action. Further, there was no attempt here to establish G.I.'s March 1965 date. Accordingly, this Court need not address the issue of whether, under 35 U.S.C. § 102(g), a March 1965 conception by G.I. would moot the issue of BTL's diligence, assuming BTL conceived before Hughes, but after March 1965, and reduced to practice after November 17, 1966.

Prior to the development of the invention in suit, a major problem in fabricating these devices was the positioning (or alignment) of the gate electrode. The devices are of very small dimensions and it was desirable to make them even smaller. It accordingly was very difficult to align precisely a strip of metal (usually aluminum) on top of the insulator which overlaid the channel separating the source and drain.

The S.G.F.E.T. avoided this alignment problem completely by virtue of its so-called "self-alignment" feature. To effect self-alignment, a silicon layer is positioned over the insulating layer covering the channel on the chip prior to forming the source and drain regions. The doping or diffusion step which results in formation of the source and drain is then performed. The silicon acts as a "mask" during this step and prevents doping of the channel region. The source and drain are thus formed precisely at the edges of the silicon gate, and the gate itself becomes sufficiently doped to become a conductor and thus act as an electrode.

This sequence, performing the diffusion step after placement of the gate electrode, had been impossible using the prior art, for the metal gates, usually aluminum, would melt at the temperatures required for diffusion.

The Work At Bell Telephone Laboratories.

Work on a S.G.F.E.T. by the Kerwin[4] group can be traced to a meeting held at BTL in February, 1966. The

---

[4] The named inventors on the BTL patent are Robert E. Kerwin, Donald L. Klein and John C. Sarace. At all relevant times, Klein was supervisor of the group which included Kerwin and Sarace. (PX-3; T-43-44, 275, 680). Since Kerwin was the first-named inventor, the Court as a matter of convenience uses the terms "Kerwin group" and "Kerwin invention".

meeting was called by Donald Klein, and was attended by members of his research group, as well as by other BTL technical personnel. Kerwin and Sarace were among those attending the meeting. (T-49, 278, 680).

The purpose of the meeting was to discuss problems which arose in making integrated circuits composed of large numbers of solid state devices. A significant problem respecting "yields" was always present in the manufacture of the circuits in a multi-step process. Even when each step in a process was highly efficient and resulted individually in a high yield, after a sequence of many such steps had been performed on a given device array, the percentage of operative devices in the array would be unsatisfactorily low. To overcome this problem, Klein hoped that his group would be able to come up with a so-called "go, no-go" sequence of device fabrication steps. A sequence of "go, no-go" process steps could approach 100% efficiency for it envisaged the use of materials which either would or would not be subject to reaction in a given chemical process step. (T-45-47; 49-50).

During the course of this meeting, at which a variety of potential process steps were discussed, Kerwin came to the key realization that placement of a thermally resistant gate prior to doping of the source and drain regions would eliminate the problems encountered in aligning the gate electrode. (T-280-85). Silicon, a material with which the group had experience, was the thermally resistant material chosen. (T-286). The S.G.F.E.T. fabrication process which resulted from this meeting was recorded by Klein (PX-10). Somewhat later, in early March, following discussion between Klein and his superior Hugh M. Cleveland, the latter developed a chart detailing the work assignments that would be involved in carrying out the project. (PX-15; T-576-77). In summary, the fabrication sequence involved the following steps:[5]

1. Preparation of a silicon chip. This step, while rather involved and time consuming, is only the preparation of starting materials. It does not relate directly to the invention.

2. Deposition of an insulating layer on the upper surface of the chip. The parties disagree on which insulating materials were initially embraced by the Kerwin group. Without question, silicon nitride was the insulator of choice by those at the February meeting. The contemporaneous evidence, however, convinces this Court that silicon nitride was not the only insulator considered. Reference to silicon nitride was somewhat equivocable, e. g., Klein's notes (PX-10) in reference to this insulating layer, contains the notation "(Si_3N_4?)" and Cleveland's notes (PX-15) expressly indicate that an alternative to silicon nitride was considered. This alternative insulator was a layer of silicon oxide over the silicon, followed by a layer of silicon nitride. This two layer insulating medium is referred to as a "sandwich". *See* Fig. 1, Appendix.

3. Deposition of a layer of silicon oxide on top of the insulating layer. *See* Fig. 2, Appendix.

4. The selective etching away of the silicon oxide layer from the surface of the chip. This etching was to be effectuated by a so-called photoresist technique. The photoresist technique is used to place a plastic film over a portion

[5] The following enumeration of steps is somewhat arbitrary. Further, the list is not all inclusive; steps of minor relevance to the discussion have been deleted. This fabrication sequence is also found in the Kerwin patent. (PX-1).

of the surface of the device.[6] The plastic film then functions as an etch mask for the subsequent removal of undesired portions of the underlying silicon oxide layer. *See* Fig. 3(A), Appendix. This is possible because certain agents which will dissolve silicon oxide, e. g., ammonium bifluoride, will be unreactive to the plastic film. Further, the ammonium bifluoride will have little effect on the underlying silicon nitride layer—thus in the jargon of the BTL group, the etch process would be "go, no-go"—go as to the silicon oxide and no-go as to the silicon nitride.

The remaining portions of the photoresist material are then removed. *See* Fig. 3(B), Appendix.

5. Deposition of a silicon layer across the entire surface. *See* Fig. 4, Appendix.

6. Placement of a plastic film by photoresist procedure over selected portions of the silicon layer, followed by etching away of a portion of the silicon layer with a mixture of hydrofluoric, nitric and acetic acids saturated with iodine. This mixture has little effect on the layers underlying the silicon. Subsequently the plastic film is removed by suitable solvent. *See* Fig. 5, Appendix.

7. Removal of exposed silicon oxide by use of ammonium bifluoride which will remove exposed SiO_2 but have little effect on silicon or silicon nitride. *See* Fig. 6, Appendix.

---

[6] This technique, old in the art, involves coating the entire surface of the chip with a plastic material having photochemical properties. A photographic "mask" containing appropriate appertures could then be placed over the surface. The masked chip is then exposed to light, the light being allowed to strike only those areas of the chip on which it is desired to have the plastic film remain. Following exposure to light, the unexposed portions of the plastic film are removed with an appropriate organic solvent, with the exposed portions of the plastic film remaining intact.

8. Removal of the silicon nitride layer by use of hot phosphoric acid, a solvent to which the underlying silicon or, in the case of the sandwich, silicon oxide, is impervious. In the case of the sandwich, underlying silicon oxide must then also be removed, again using ammonium bifluoride. In these etch steps, the silicon gate functions as an etch mask over the underlying insulator. These etch steps are followed by the diffusion or "doping" step, which results in formation of the source and drain electrodes. During this latter procedure, the silicon gate acts as a diffusion mask. *See* Fig. 7.

9. Metallization. This step involves placement of metal on the electrode surface. This is required in order to facilitate attachment of wires to the device.

Following the February meeting, BTL investigators immediately began to try to produce field effect transistors using the newly devised fabrication sequence. Many of the individual steps in the process, however, were time-consuming, though routine. Accordingly, the first semi-completed devices were not tested until late May or early June of 1966. The devices which were then tested employed a single silicon nitride layer, and not the sandwich, as a gate insulator. Further, these devices were not "metallized". That is, the devices did not have metal covering the electrode surfaces for the attachment of wire leads. Accordingly, the devices were tested using a so-called probe test.

A probe test involves the physical placement of wires against the electrode surfaces—the physical placement being facilitated by holding the device array in a clamp and moving wire probes with a micrometer-like screw down on to the appropriate surface locations. The operator performing the test peers through a microscope while making contact to ascertain that the wires are being held against the desired electrode. (T-194-99).

The late May-early June probe tests of the nitride devices were clearly successful. The tests showed a "transistor effect", i. e., they showed drain-to-source current as a function of drain-to-source voltage for different applied gate voltages, which curves were within a commercially accepted range; and the tests showed this result was true for a high proportion of the devices tested. (PX-24).

After the probe tests were performed, Sarace attempted to metallize the devices. The conventional procedure would have been to use a so-called "aluminization" process. The parties agree that such a process would have been routine and its effectuation would have been within the purview of one of ordinary skill in the art.[7] Sarace, however, elected to perform a "platinization" procedure.[8] This procedure was somewhat experimental but was also a more rapid and convenient procedure. (T-81, 151).[9] Unfortunately for

[7] Although Dietrich A. Jenny, testifying for Hughes, agreed that the process itself would have been routine, he testified, in effect, that the outcome could not have been predicted with certainty. (T-880-81, 888).

[8] Sarace did not actually perform the platinization step himself. That procedure was performed by others at BTL at his request. (See DX-16 at 16; T-691-92). Similarly, an aluminization would have been performed by others. (T-174).

[9] The platinization procedure in essence involved the vacuum deposition of metallic platinum over the surface of the device followed by a heat treatment. The heat would convert any platinum over silicon into platinum silicide, a conductor. Following this formation of platinum silicide over exposed silicon, the wafer could be washed with acqua regia to remove unreacted platinum. (T-79-81, 347-48). In contrast, an aluminization procedure would be more time consuming for it would involve photolithographic masking operations.

Sarace, the platinization procedure, which was performed in late June 1966, produced only "shorted" devices. (PX 16 at 56; T-741-42).

Up until this time, work on the silicon gate project had required the efforts of several individuals. From this time on, however, Sarace was the only BTL employee to be assigned essentially full time to the project. (T-703, 732, 788). Following the failure with platinization, Sarace did not immediately switch to a conventional metallization procedure. Rather, he performed a microscopic examination of the shorted device in an effort to determine the source of the shorts. This examination failed to reveal the source of the shorts, but it did disclose an over-etching step. (PX-16 at 56). Although this over-etching had apparently not been exemplified in prior tests of the electrical characteristics of the devices, Sarace proceeded with a series of tests aimed at developing more precise etching-step parameters. This phase of Sarace's work continued into August of 1966. In addition, Sarace worked on several other problems affecting the devices.[10]

During the course of his work on these problems, Sarace became aware of a further problem, a hysterisis effect on the devices having a silicon-to-silicon nitride interface.[11]

[10] These problems included, *inter alia:* (1) overly high "P-channel thresholds" initially thought to be caused by improper cleaning techniques, but which were solved by use of a hydrogen anneal (T-710-11); and (2) the failure of the photoresist material to adhere properly to silicon. (T-709).

[11] Sarace explored this hysterisis effect using capacitors rather than S.G.F.E.T.'s as a test vehicle. This was because capacitors containing a silicon-to-silicon nitride interface were easier to fabricate than were S.G.F.E.T.'s, and tests of the electrical properties of such capacitors could be extrapolated to S.G.F.E.T.'s (T-712, 773-74).

Hysterisis can be considered a type of electrical instability.[12] While hysterisis did not make these devices totally unsatisfactory, it was a deficiency which it was desirable to overcome. Accordingly, Sarace directed his efforts to overcoming the hysterisis problem. A solution to the hysterisis problem was somewhat elusive. Sarace's notebook (PX-16) indicates that up until October 17, 1966 no solution to the hysterisis problem had been found.

There are no entries from October 17, 1966 until January 17, 1967 in the laboratory notebook of Sarace, the only BTL employee then devoting full time to the S.G.F.E.T. project. The activities at BTL during this period are not recorded on a day-to-day basis and, therefore, must be gleaned from (1) the testimony of Sarace and others;[13] and (2) certain other supporting documents. The earliest dated documents showing a solution to the hysterisis problem are in form of viewgraph slides (PX-42) which were prepared in conjunction with a talk that Sarace gave at a meeting with another group of BTL workers in Allentown, Pennsylvania. This meeting was held December 9, 1966 (T-793), and the viewgraphs were presumably prepared shortly before that date. These viewgraphs slides show

---

[12] The hysterisis was exemplified by a displacement in plots of gate capacity vs. gate voltage which was observed when a plot that had been made while increasing voltages was compared with a plot made immediately thereafter, while decreasing voltages. *See,* e. g., PX-42 at 7.

[13] Klein testified to contact with Sarace during the period in which Sarace was the only BTL inventor working full time on the silicon gate project. (T-166, 174). There was also testimony by other workers at BTL who had some minor recollection of contact with Sarace in connection with the S.G.F.E.T. project in the fall of 1966. *See, e. g.,* testimony of Roger Edwards. (T-503D-504).

that sometime prior to December 9, Sarace had employed the so-called "sandwich" construction and that this construction had resulted in elimination of the hysterisis problem.

Another document which supports a November date of completion for a S.G.F.E.T. utilizing the sandwich construction is a memorandum dated January 5, 1967 (PX-48) sent from Mr. Biondi, the director of the electron device laboratory, to Mr. Cave of the BTL Patent Department. Although the memorandum is over Mr. Biondi's signature, it was actually written by Kerwin. (T-326). This memorandum indicates that subsequent to a prior memorandum dated November 15, 1966 (PX-35), the "sandwich" process was employed; that the sandwich process improved electrical stability; and that sandwich-containing devices were undergoing life tests.

In life tests, the devices are subject to stress conditions, e. g., elevated temperatures, and periodically data is gathered from the devices to check for changing electrical characteristics; that is, the devices are placed in a furnace and removed at given intervals for electrical testing, then returned to the furnace for a further time interval. These life tests are used to indicate the "stability" and "reliability" of the devices. (T-152, 321-22). Also they would show whether a device would "last long enough to be useful". (T-231). These tests required, as a practical matter, that the devices first be metallized. (T-152, 714).

Not until January 1967 did the Patent Department at BTL commence preparation of a patent application directed to the Kerwin invention. The application was filed March 27, 1967.

The Existence Of An Interference.

Although Hughes at one time acceded to BTL's position that an interference existed, the Court expressed reluctance to accept a stipulation on this question. Since the question of whether an interference exists may, in a § 291 suit, be characterized as going to the Court's subject matter jurisdiction, the Court deemed it inappropriate for the parties to stipulate to the matter. The Court asked the parties to address themselves anew to the question of the existence of an interference in their post-trial briefs.

Hughes again contends that no interference exists, but the Court is of the view that the evidence in the record unequivocally supports the existence of an interference. As this Court noted in denying Hughes' dismissal motion, the allegedly interfering claims of the Dill and the Kerwin patents differ in only one respect—the process claimed in the Dill patent recites a step of "etching away the exposed portions of said insulating layer", while the corresponding step in the Kerwin patent reads "etching away the exposed portions of said insulating layer *using said silicon layer as a mask*". (emphasis added). See 185 U.S.P.Q. at 661.

However, in Dill's original Invention Disclosure which he submitted to the Hughes' Patent Department, he referred to the use of the "Si layer as a mask". (Pretrial Order ¶27). Further, the parties agree that Dill correctly testified before this Court in the *Hughes* v. *General Instruments* trial that his invention did not require a separate masking step and that those skilled in the art would recognize that the silicon gate itself acted as an etch mask. (Pretrial Order ¶33). Thus, this Court is satisfied that Claim 1 of the BTL patent and Claim 5 of the Hughes patent are, in fact, interfering.

After trial, Hughes advanced two additional arguments in support of the view that the patents were not interfering. First, Hughes contended that if the Dill process were modified to include the deposition of metal on top of the silicon gate, then that metal, and not the silicon, would act as an etch mask. There is no testimony or suggestion in the record, however, that indicates the Dill process has never been so practiced. Further, it is not evident to this Court that even if the process were so practiced that the metal would perform as the mask to the exclusion of the underlying silicon. Second, Hughes contended that the use of silicon as an etch mask in the Kerwin process refers to the use of silicon as a mask for the field oxide layer, which layer is lacking in the Dill process. Again, since the issue was raised after trial, the Court has no testimony in support of this view. However, as this Court understands the Kerwin process, the fact that silicon may act as an etch mask for the field oxide does not diminish the fact that the silicon gate also inevitably serves as an etch mask with respect to the gate insulator. Accordingly, the Court finds that an interference for purposes of § 291 does, in fact, exist.

Conception.

A "conception is the mental part of the process in arriving at invention". *Electro-Metallurgical Co.* v. *Krupp Nirosta Co.*, 122 F.2d 314, 318 (3rd Cir. 1941). Conception is not, however, merely "the perception or realization of the desirability of producing a certain result; rather it is the perception or realization of the means by which the result can be produced." 1 Rivise and Caesar, Interference Law and Practice § 110 (1940). Further, this mental possession of the means must be such that completion or effectuation of the invention requires no more than

routine skill. Accordingly, the need for extensive subsequent research will negate an earlier asserted date of conception. *See Alpert* v. *Slatin,* 305 F.2d 891, 894 (C.C.P.A. 1962). It is clear that at their February 1966 meeting, the BTL group did more than merely recognize a problem. Hughes argues, however, that the February conception was incomplete in that extensive research was required to reduce the February conception to practice. The BTL inventors acknowledged that at the time of the February meeting, they were uncertain of their ability to carry out certain of the process steps envisaged in their conception. *See, e. g.,* T-287. Viewing the events after the fact, however, this Court is convinced that BTL inventors faced no problems in pursuing a reduction to practice which required the use of inventive skill. That is, while it was impossible in February 1966 to state with certainty that the BTL process would work, events would show that the process did work. Further, while the process of reducing the invention to practice was lengthy, this was not primarily the result of extensive experimentation required for a successful reduction to practice. Many of the individual process steps, though old in the art, were quite time consuming. Further, much of the experimentation was directed to solving the hysterisis problem, a problem which in itself would not have precluded a successful reduction to practice.[14] Accordingly, this Court is convinced that BTL has

[14] Hughes also argued that the February conception was deficient in that it did not envisage the use of the sandwich construction, which construction was ultimately used by BTL in their completed devices. As is clear from the discussion of facts *supra,* however, this Court is of the view that the sandwich construction is amply demonstrated in the documents that came out of the February meeting.

met its burden of proof[15] respecting its entitlement to a February-March conception date.

Reduction To Practice.

"A process is said to be reduced to practice when the series of steps constituting the process are carried out in such a manner as to demonstrate the practicability of the process." Rivise & Caesar, *supra,* § 131 (citing *Corona Cord Tire Co.* v. *Dovan Chemical Corp.,* 276 U.S. 358, 48 S.Ct. 380, 72 L.Ed. 610 (1928)). Further, in the case of a product-producing process, a reduction to practice requires the establishment of utility for the products produced by the process. *See, e. g., Tennessee Valley Authority* v. *Monsanto Chemical Co.,* 383 F.2d 973, 977 (5th Cir. 1957). Accordingly, the date of BTL's reduction to practice is the date on which BTL can show that it produced a useful field-effect transistor using the silicon gate process.

BTL contends that such a reduction to practice was shown by the probe tests in the period of late May to early June 1966. Hughes contends that the probe tests involved less than completed devices and, as such, they were insufficient to demonstrate a reduction to practice.[16]

[15] The Kerwin inventors, who filed their application five months after Dill, would be the junior party in the Patent Office and thus have borne the burden of proof. 37 C.F.R. § 1.257. Although it is not clear that the burden should always be so allocated in a § 291 proceeding, where as here the junior party is also plaintiff, this Court has no problem concluding that such party should bear the burden of proof.

[16] It is Hughes' position that a metallized device is a prerequisite to reduction to practice, notwithstanding the fact that the claims of the Kerwin patent do not encompass a metallization step, and that metallization was an established art.

There are a multiplicity of opinions dealing with the question of whether or not a given laboratory or bench test constitutes a reduction to practice in a particular case. *See, e. g.,* Rivise & Caesar, *supra,* § 143 and § 144. The frequently stated rule is that "a test under service conditions is necessary in those cases, and in those only, in which persons qualified in the art would require such a test before they are willing to manufacture and sell the invention, as it stands." *Sinko Tool & Manufacturing Co.* v. *Automatic Devices Corp.,* 157 F.2d 974, 977 (2d Cir. 1946).

While this Court is convinced that the May-June 1966 probe tests constituted a successful intermediate experiment, BTL has failed to establish that those tests demonstrated that the devices possessed the utility required for a reduction to practice. The testimony of BTL's own inventors was that life tests of completed devices were necessary in order to demonstrate that the devices were reliable and useful.[17] These life tests establishing a reduction to practice were not completed until December 1966-January 1967.

Diligence.

Since BTL has established a date of conception prior to Dill's date of conception but has established a date of reduction to practice subsequent to Dill's date of reduction to practice, BTL can prevail only if the Kerwin group is found to have exercised reasonable diligence from just prior to Dill's conception up until their reduction to practice in December 1966-January 1967.

---

[17] BTL urges that this Court's opinion in *Hughes Aircraft Co.* v. *General Instruments, Inc.,* 374 F.Supp. 1166, implies that successful, corroborated probe tests of an S.G.F.E.T. will suffice for a reduction to practice. This Court does not, however, read its prior opinion as so holding.

"The party chargeable with diligence must account for the entire period during which diligence is required." *Gould* v. *Schawlow,* 363 F.2d 908, 919 (C.C.P.A. 1966). Further, in making such account, the testimony of the inventor alone is usually deemed insufficient. *Id.* at 919; *Sletzinger* v. *Lincoln,* 410 F.2d 808, 812 (C.C.P.A. 1969).

There is no question that the Kerwin inventors were diligent from the time of their February-March 1966 conception up until the time of the probe tests in May-June 1966. In the second half of 1966, however, Sarace was the only inventor devoting full time to the project and his records show a substantial void, from October 17, 1966 until January 17, 1967. Sarace testified that it was in this period that he returned to the "sandwich" conception, and constructed and tested such a device, though his notes do not reflect this. However, certain other evidence does corroborate Sarace's testimony of full-time efforts on the S.G.F.E.T.

On December 9, Sarace presented viewgraphs with test data from sandwich devices to a meeting at Allentown, and this indicates that BTL workers had completed fabrication of these devices by late November 1966.[18] Further, the January 5, 1967 Biondi memorandum (PX-48) indicates that the time-consuming life tests were then underway.

While a day-to-day corroboration of Sarace's testimony regarding his activity during the fall of 1966 would be desirable, this Court concludes that its absence is not fatal to BTL's case. It is sufficient that BTL has estab-

---

[18] Such date would be required in order for Sarace to test the devices and prepare for the December 9 presentation. As indicated by the November 15, 1966 and January 5, 1967 Biondi memorandum (PX-35 and 48), sandwich devices had not been constructed before mid-November 1966.

lished by competent evidence an inference more reasonable than not that work on the silicon gate process continued uninterrupted from prior to Dill's date of conception until completion of the life tests which constituted a reduction to practice. The Court thus finds that BTL has met its burden of proof regarding the exercise of reasonable diligence.[19]

Accordingly, BTL is declared to be prior inventor of that subject matter common to the Dill and Kerwin patents.

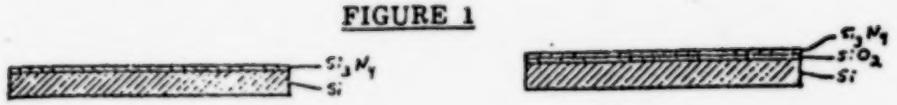
Submit order.

---

[19] Hughes argued vigorously that the time spent by Sarace pursuing a solution to the hysterisis problem should not be credited toward reasonable diligence. This Court does not agree. Although there is authority in support of the view that diligence respecting one element of a combination is not diligence respecting the use of that element in combination with another, *Riche* v. *Permutit Co.*, 47 F.Supp. 275 (D.Del. 1942), that authority is not applicable here. In this Court's view, the silicon gate process, as it existed in the fall of 1966, cannot be readily subjected to rigid compartmentalization. Accordingly, Sarace's work on problems inhibiting commercial ultilization of the process should be deemed reasonable diligence, whether that work encompassed the whole of the process, one step in the process, or an ultimately abandoned step.

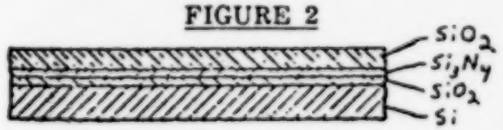
APPENDIX

FIGURE 1



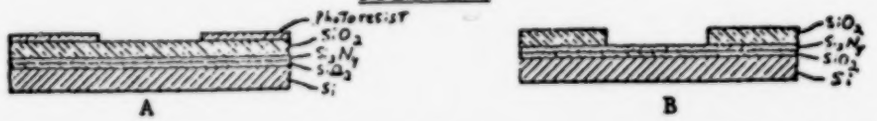
Schematic representation of (A), silicon (Si) chip on which a silicon nitride (Si_3N_4) layer has been deposited and (B), silicon chip on which a silicon oxide (SiO_2) layer has first been deposited, followed by a silicon nitride layer. Figure 1B represents the so-called sandwich construction. It is that construction which is depicted in all of the following figures.

FIGURE 2



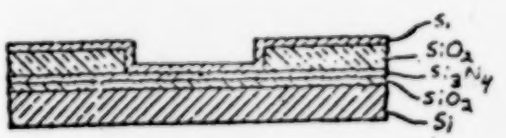
Schematic representation of device following completion of step 3.

FIGURE 3



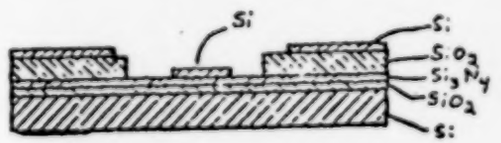
Schematic representation of (A) device following photoresist step and (B) device following etching of SiO_2 and removal of photoresist.

FIGURE 4



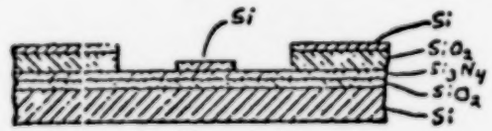
Schematic representation of device following step 5.

FIGURE 5



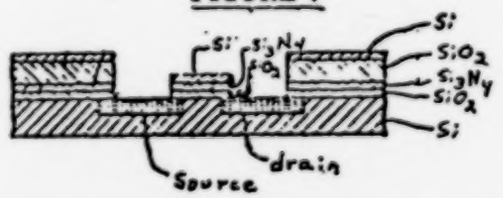
Schematic representation of device following step 6.

FIGURE 6



Schematic representation of device following step 7.

FIGURE 7



Schematic representation of device following step 8.